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# Eight New Taxa and Two New Reports of Bambuseae (Poaceae: Bambusoideae) from Colombia

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**ABSTRACT.** Morphological characters support the description of seven new species and one variety of Bambusoideae from Colombia belonging to four genera of woody bamboos: *Arthrostylidium*, *Chusquea*, *Guadua*, and *Rhipidocladum*. The new species and variety are described, illustrated, and compared with putatively related species. They are *Arthrostylidium auriculatum*, *A. chiribiquetensis*, *A. punctulatum*, *A. virolinensis*, *Rhipidocladum abregoensis*, *Guadua angustifolia* var. *nigra*, *Chusquea antioquiensis*, and *C. arachniforme*. A revised key to the South American species of *Arthrostylidium* is presented. Two genera of woody bamboos previously unknown in Colombia are documented to occur there. *Otatea*, thought to be restricted to Mexico and Central America, is found in northern Colombia, and *Merostachys*, widespread but with its diversity concentrated in southeastern Brazil, is reported from north-central Colombia.

Among the Andean countries, Colombia possesses a high diversity of woody bamboos. Londoño (1990) reported a total of 45 described species in seven genera for Colombia; just a few years later, Clark (1995) reported an estimated 63 species in eight genera for the country, without referring explicitly to the additional genus. Based on fieldwork by Londoño in 1994 and by Londoño and Clark over several years in the Andean region of Colombia, as well as examination of herbarium specimens, we here report that woody bamboo diversity in Colombia comprises nine genera and 62 described species, including those in the present paper, with an estimated species diversity of 90 including undescribed taxa. In this paper, we describe seven species and one variety new to science, and document the occurrence of two genera previously unknown in Colombia.

Two of the species, *Arthrostylidium auriculatum* and *Rhipidocladum abregoensis*, are known only from a single collection, but in each case, the plants were in flower, and qualitative differences

are sufficient to distinguish them from related congeners. We present a key to the species of *Arthrostylidium* Ruprecht in South America, revised from Judziewicz and Clark (1993) to include the four species described here. Tables comparing *A. virolinensis* with the other three species of the genus with zig-zag/flexuous synflorescences, and *R. abregoensis* with two similar, narrow-leaved congeners are included.

Our interpretation of reproductive morphology follows that of Stapleton (1997) and Judziewicz et al. (in press). The spikelet is considered to be an inflorescence, based on which an aggregation of spikelets is here termed a synflorescence. The stalk of the spikelet is therefore a peduncle, and the axis of the spikelet is the rachis. The principal axis of the synflorescence is referred to as the main axis, and the branches are paraclades. A cophlorescence is a set of one to several paraclades derived from a single axis; in our taxa, a cophlorescence may consist of a single spikelet, a first-order paraclade bearing spikelets, or a first-order paraclade with higher orders of branching. We also note that in *Rhipidocladum* McClure and *Arthrostylidium*, the glumes, sterile lemmas, and fertile lemmas are not always morphologically very distinct from each other (Clark & Londoño, 1991). The glumes and sterile lemmas of *Chusquea* Kunth also intergrade frequently (Clark, 1996). We here refer to all of the empty bracts at the base of a spikelet as glumes, and all synflorescence bracts enclosing a bud as gemmiparous bracts.

## NEW REPORTS

### ***Merostachys* Sprengel**

During a visit to the herbarium at the University of Medellín (HUA) in June 1994, the authors identified two vegetative specimens representing what are probably two undescribed species of *Merostachys*. The Pohl specimen had been seen before, but its significance was unappreciated until we saw



both specimens together. Both records of this genus in Colombia are from Antioquia. Southeastern Brazil is the center of diversity for *Merostachys*, and although the genus extends into southernmost Chiapas, its occurrence outside of Brazil is generally as widely scattered populations.

COLOMBIA. **Antioquia:** Mun. Guatapé, Vereda Santa Rita, al borde de un pinar, casa de la finca Montepinar en bosque dominado por palmas, 7 Ago. 1986, *Pohl & Marulanda 15398* (HUA, ISC).

COLOMBIA. **Antioquia:** Mun. Vigía del Fuerte, Comunidad Indígena de Jarapetó, 20–25 m, 22 Mar. 1993, *Gomez 609* (HUA).

**Otatea** (McClure & Smith) C. Calderón & Soderstrom

Londoño discovered a population of *Otatea fim-*

*briata* Soderstrom growing in a relatively dry region of northern Colombia in the department of Norte de Santander during fieldwork in April 1994. The identity of this vegetative collection was confirmed by Londoño and Clark, who has collected this species in Mexico. Until now, this genus was known only from Mexico and Central America, with most of its diversity in seasonally dry forests in Mexico (Clark, 1995). This is the only known population of this genus in South America, although it may be expected in seasonally dry habitats in western Venezuela.

COLOMBIA. **Norte de Santander:** Mun. Ocaña, Vereda San Luis, aprox. 4 km de Ocaña por la vía a Abrego, a margen derecha del río Algodonal, 1270 m, 19 Abr. 1994, *Londoño, Amaya, Jácome & Forgioni 884* (COL, TULV).

NEW SPECIES  
REVISED KEY TO THE SOUTH AMERICAN SPECIES OF *ARTHROSTYLIDIUM*

- 1a. Lowest internode of culm 3–6 m long, much longer than the very short 1–10-cm-long succeeding internode; lemma awns 4–7 mm long . . . . . *A. schomburgkii*
- 1b. Lowest internode of culm less than 1 m long, about the same size as succeeding internodes; lemmas awnless or with awns at most 3(–5) mm long.
  - 2a. Culm nodes with flaring, corky, shieldlike outgrowths about twice the diameter of the culm . . . . . *A. scandens*
  - 2b. Culm nodes with shieldlike outgrowths absent or very small, less than 1 mm wide.
    - 3a. Axes of the cymes zig-zag or less commonly flexuous.
      - 4a. Culm leaf blades reflexed; internodes retrorsely scabrid; spikelets 2.5–4 cm long with 5–9 fertile florets per spikelet . . . . . *A. ecuadorensis*
      - 4b. Culm leaf blades erect; internodes glabrous; spikelets 1–1.7(–3) cm long with (2–)3–5 fertile florets per spikelet.
        - 5a. Culm leaves 3–6.5 cm long; foliage leaf blades 0.2–0.45 cm wide; glumes obtuse, the midnerve glabrous; lemmas 4–4.5 mm long; paleas purplish, the keels glabrous . . . . . *A. virolinensis*
        - 5b. Culm leaves 7.5–25 cm long; foliage leaf blades 0.4–1.4 cm wide; glumes acute to apiculate or shortly mucronate, the midnerve scabrous; lemmas (5–)6–10 mm long; paleas yellowish to stramineous, often with purple margins, the keels ciliolate.
          - 6a. Foliage leaf blades 4–6 cm long, 0.4–0.6 cm wide; 3–5 spikelets per cyme; (2–)4–5 fertile florets per spikelet . . . . . *A. sarmentosum*
          - 6b. Foliage leaf blades 7–14.5 cm long, (0.7–)0.9–1.4 cm wide; (4–)5–8 spikelets per cyme; 3–4 fertile florets per spikelet . . . . . *A. venezuelae*
      - 3b. Axes of the cymes straight.
        - 7a. Nodal line bearing a ring of retrorsely spreading cilia; cymes 2.5–3.5 cm long, bearing 2–5 spikelets . . . . . *A. fimbrinodum*
        - 7b. Nodal line glabrous; cymes (4–)5–30(–40) cm long, bearing 4–19(–25) spikelets.
          - 8a. Lemmas with awns 1.5–3(–5) mm long . . . . . *A. simpliciusculum*
          - 8b. Lemmas awnless or with awns less than 1.5 mm long.
            - 9a. Foliage leaves with inner ligules 6–10 mm long, the blades 5–7 cm wide . . . . . *A. grandifolium*
            - 9b. Foliage leaves with inner ligules 0.1–1 mm long, the blades 0.9–5 cm wide.
              - 10a. Foliage leaf sheaths bearing true auricles at the apex . . . . . *A. auriculatum*
              - 10b. Foliage leaf sheaths lacking true auricles.
                - 11a. Internodes pithy in the middle with longitudinal air canals toward the periphery; culm leaf blades inflated near the junction with the sheath; spikelets strongly diverging from the axis of the cyme . . . . . *A. chiribiquetensis*
                - 11b. Internodes hollow with thick walls, longitudinal air canals absent; culm leaf blades not inflated; spikelets appressed to the axis of the cyme.
                  - 12a. Foliage leaf blades 2–5 cm wide; spikelets 2.5–5 cm long; fertile florets 5–14 per spikelet.
                  - 13a. Culm leaves uniform in color, blades ca. twice as long as



- the sheaths; branch complement with a strongly dominant primary branch and several smaller secondary branches; fertile florets 10–14 per spikelet; lemmas 13–16 mm long, uniform in color; coastal cordillera of Venezuela. . . . . *A. longiflorum*
- 13b. Culm leaves maculate when young, blades  $\pm$  equal to the sheaths; branch complement with all branches subequal; fertile florets 5–10 per spikelet; lemmas 9–10.5 mm long, maculate; eastern cordillera of Colombia . . . *A. punctulatum*
- 12b. Foliage leaf blades 0.9–2.3(–2.8) cm wide; spikelets 1.3–3 cm long; fertile florets 2–5(–6) per spikelet.
- 14a. Culm leaves with sheaths hispid, the blades with truncate bases; foliage leaf blades (5–)7–11 per complement, 0.9–1.4(–2) cm wide; spikelets 2.2–3 cm long, rachis internodes 5–7 mm long . . . . . *A. pubescens*
- 14b. Culm leaves with sheaths glabrous or nearly so, the blades usually with oblique bases; foliage leaf blades 3–5 per complement, 1.3–2.3(–2.8) cm wide; spikelets 1.3–2.3 cm long, rachis internodes 2–3 mm long . . . . . *A. youngianum*

**Arthrostylidium auriculatum** Londoño & L. G. Clark, sp. nov. TYPE: Colombia. Antioquia: Mun. Amalfi, Km 11.6 de la via Amalfi-Porce, a orilla de la Quebrada Caracolí, 1510(–2000) m, 15 jun. 1994, X. Londoño & L. G. Clark 895 (holotype, HUA; isotypes, AAU, COL, ISC, JAUM, K, MEDEL MO, NY, TULV, US). Figure 1.

Bambusa lignosa. Rhizoma sympodiale pachymorphum. Culmi 2–4 m alti, 2–3 mm diam. cylindrici graciles cavi. Folia culmorum persistentia ad basem; basi vaginarum annulati incrassati induratique. Ramificatio intravaginalis, supra promontorium, rami 3–5, ramo centrali subdominanti. Vaginae foliorum pubescens biauriculatae, auriculis tortilibus, longifimbriatis; laminae foliorum lanceolatae vel lineari-lanceolatae, 5–16  $\times$  1.2–2.5 cm, abaxialiter pubescens. Synflorescentiae ramos terminantes, 15–30 cm longae, 1–5 cofillorescentibus, racemiformibus, spicula 7–19 multiflora. Spiculae 1.3–2.2 cm longae; glumae 3; flosculi fertiles 2–3 et anthoecium rudimentale terminale.

Woody bamboo. *Rhizome* sympodial, pachymorph. *Culms* 2–4 m long, 2–3 mm diam., scandent, scrambling to hanging above. *Internodes* 30–49 cm long, the basal ones 4.5–20 cm long, cylindrical, hollow, lumen 0.5–1 mm diam., glabrescent, green when young becoming yellowish to stramineous. *Bud* one per node, positioned ca. 1.5–2.5 mm above the nodal line, terminal to a promontory. *Branching* intravaginal, 3–5 branches per node, with one slightly dominant central branch from a segmented promontory 4–6 mm above the nodal line. *Culm leaves* stramineous, appressed to culm, basally persistent, rotting in place, strongly attached by a basal, dark, well-marked, corky flange, the middle and upper ones pushed away by the developing axillary branches; *sheaths* 4–8 cm long, abaxially pubescent, ciliate along one margin; *blades* erect. *Foliage leaves* 4–6 per complement (from flowering material); *sheaths* green when young, turning stramineous, abaxially pubescent,

strongly nerved, bearing auricles and fimbriae at the summit, ciliate along one margin, strongly attached at the base; *auricles* 1–2.5 mm long, fimbriate, purplish brown, twisted; *fimbriae* 5–8 mm long, purplish to brown, smooth, straight to sinuous, rigid basally, arching apically; *outer ligule* less than 0.3 mm long, glabrous, shiny; *inner ligule* 0.5 mm long, pubescent; *pseudopetiole* 3–5 mm long, glabrous, purplish, twisted; *blades* 5–16 cm long, 1.2–2.5 cm wide, lanceolate to linear-lanceolate, 14–15-nerved, adaxially glabrous, abaxially tomentose, the midnerve slightly manifest basally, the base rounded-truncate, the apex acuminate, the margins scabrous. *Synflorescences* usually terminating leafy branches of all orders, consisting of 1–5 cofillorescences, these separated by internodes 4–8 cm long. *Cofillorescences* 15–30 cm long, erect to arching, consisting of 1 subtending bract, 1 prophyll, 0–1(–2) gemmiparous bracts, and 7–19 multiflowered spikelets, these separated by internodes 0.3–2 cm long, the axis straight, hispidulous to glabrescent; *subtending bract* throughout the main axis like a fully developed branch leaf with fimbriate auricles at the summit and a deciduous blade, varying to a narrowly triangular bract, 2.6–3 cm long, 2–3 mm wide, 7-nerved, adaxially glabrous, abaxially hispidulous, mucronate, the mucro 0.5–1 mm long, the margins ciliate; *prophyll* a thin, transparent membrane, 13–27 mm long, 1.2–3 mm wide, glabrous, 2-keeled, the keels ciliate; *gemmiparous bracts* 1.5–3 cm long, 2–3 mm wide, membranaceous, glabrous. *Spikelets* 1.3–2.2 cm long (estimated from young spikelets and disarticulated florets), slenderly lanceolate, purplish green when young then stramineous, puberulous, apparently with scattered siliceous deposits on the surface, erect and appressed to the main axis, consisting of 3 glumes, 2–3 fertile florets, and a terminal rudimentary floret, pedun-



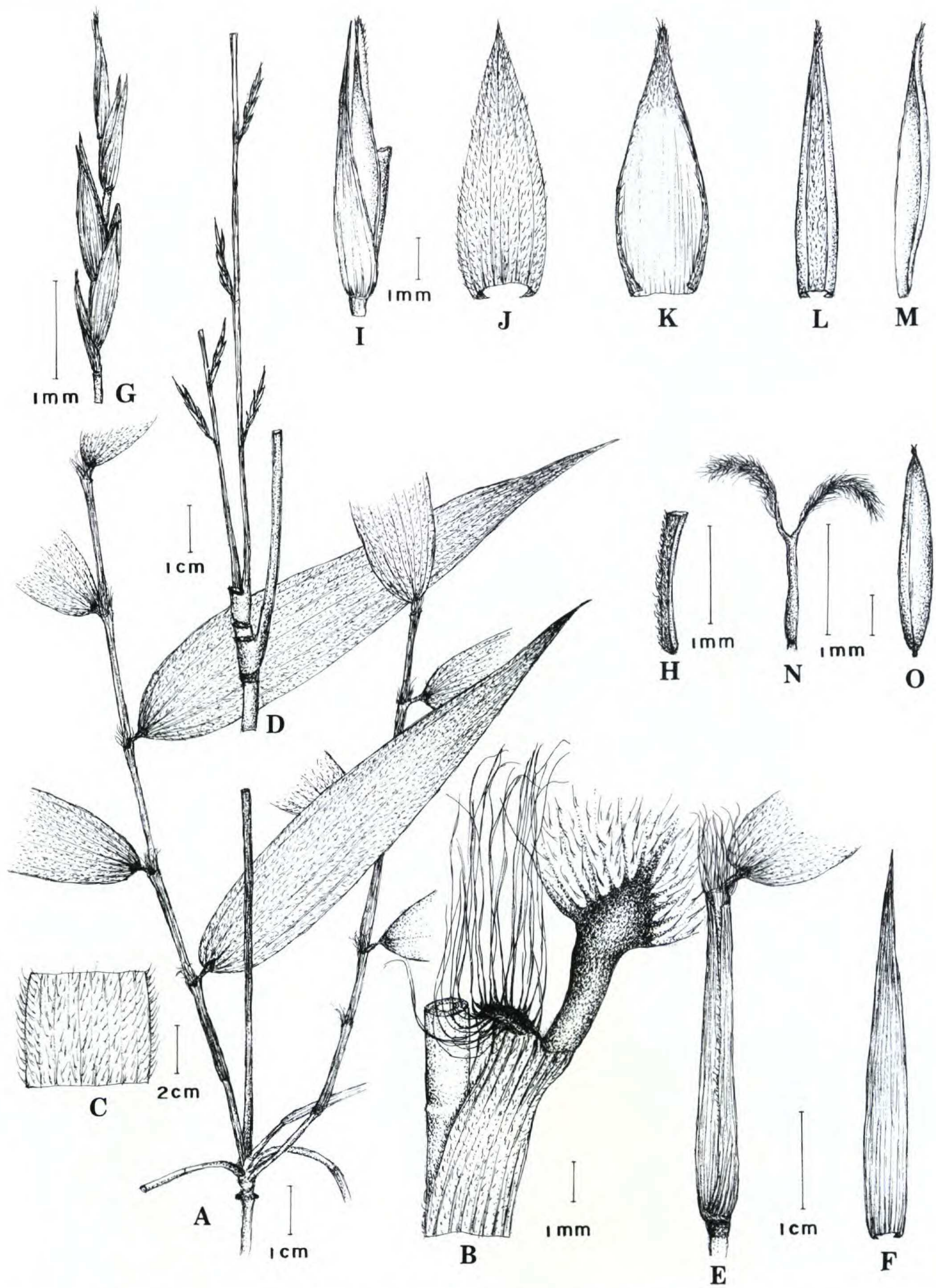


Figure 1. *Arthrostylidium auriculatum* Londoño & L. G. Clark. —A. Branch complement with foliage leaves. —B. Foliage leaf, ligular area. —C. Detail of blade showing appressed hairs. —D. Flowering branch. —E. Subtending bract. —F. Prophyll, adaxial view. —G. Spikelet. —H. Rachis internode. —I. Fertile floret. —J, K. Lemma, abaxial and adaxial views. —L, M. Palea, adaxial and side views. —N. Gynoecium. —O. Caryopsis. (Based on Londoño & Clark 895.)



culate, the peduncles 0.5–0.8 mm long; *rachis* segments 3–5 mm long,  $\frac{1}{2}$ – $\frac{2}{3}$  the length of the floret, the upper  $\frac{1}{3}$  hispidulous, flat, disarticulating just below the next lemma; *glumes* 4.5–6 mm long, 1–2 mm wide, ovate-lanceolate, 3-nerved, apiculate, marginally ciliate, abaxially puberulous, adaxially glabrous and puberulous toward the apex; *lemmas* 6–7.5 mm long, 2–2.5 mm wide, shorter than or equal to the palea, 7–8-nerved, ovate-lanceolate, mucronate, ciliate along one margin, adaxially glabrous but densely pubescent on the upper  $\frac{1}{3}$ , abaxially puberulous, the mucro 0.4–0.6 mm long, the midnerve prominent only distally; *palea* 6–7.5 mm long, 0.8–1.3 mm wide, usually equaling or slightly longer than the lemma, 2-keeled, 1-nerved between the keels, adaxially glabrous, abaxially puberulous, the margins of the palea glabrous. *Lodicules* and *stamens* not seen. *Ovary* fusiform, glabrous, 1–1.1 mm long; style 1, stigmas 2, yellowish brown, plumose, up to 1.5 mm long. *Fruit* a caryopsis, 5.5 mm long, 0.7–1 mm wide, reddish brown, glabrous, the hilum side slightly curved, the embryo side flattened; *embryo*  $\frac{1}{7}$  the caryopsis length; *hilum* purplish, as long as the caryopsis but more prominent basally; *style base* 0.3 mm long, persistent, glabrous, lighter in color than the caryopsis.

*Distribution.* At the northern extreme of the Central Cordillera of Colombia, in the Department of Antioquia, Mpio. Amalfi; on steep slopes in montane forest; 1500–2000 m.

*Arthrostylidium auriculatum* is distinguished by the presence of fimbriate auricles at the summit of the foliage leaf sheaths, tomentose abaxial surfaces of the foliage leaf blades, hispidulous to glabrescent cymes and rachis segments, puberulous spikelets apparently with scattered siliceous deposits on the surface, and lemmas shorter than or equal to the paleas and abaxially puberulous. This unusual species is known only from the type collection. The true auricle in this species is unique in the genus. The so-called auricle of *A. grandifolium* Judziewicz & L. G. Clark (Judziewicz & Clark, 1993) is a sheath summit extension, not homologous to the true, blade-derived auricle (Judziewicz et al., in press). *Arthrostylidium auriculatum* and *A. grandifolium* do share thick-walled internodes up to 50 cm long, but otherwise are readily distinguishable (see Key).

***Arthrostylidium chiribiquetensis*** Londoño & L. G. Clark, sp. nov. TYPE: Colombia. Caquetá: Sierra de Chiribiquete, bosque en la base de la Mesa Norte, 1°05'N, 72°40'W, 600 m, 26 ago. 1992 (fl), P. Palacios, P. Franco, O. Rangel & J. Betancur 2681 (holotype, COL; isotypes, COAH, FMB, MA, US). Figure 2.

*Bambusa lignosa* cespitosa. Rhizoma sympodiale pachymorphum. Culmi 3–5 m alti, 3–6 mm diam. scandentes cylindrici scabridi, centro meduloso et longitudinalibus canalis aeriarum epidermidem versus; internodiis 7–52 cm longis. Folia culmorum erecta appressa; vagina culmorum longifimbriata; basi laminarum culmorum coriacea fuscata zona signata. Ramificatio intravaginalis supra promontorium, ramo centrali dominanti 2–4 lateralibus brevibus. Vaginae foliorum longifimbriatae, laminae foliorum ovato-lanceolatae, (6–)12–15(–18.5) × 2–5 cm, utrinque glabrae et tessellatae. Synflorescentiae 2–5 cymescentibus, spicula 10–18 multiflora. Spiculae (5–)9–17 mm longae, angulo (60–)75–130° a axe divergentes; glumae 1–2; flosculi fertiles 2–3 et anthoecium rudimentale terminale. Ovarium fusiforme, glabrum, 0.7–1 mm long; stylus 1; stigmata 2.

Caespitose woody bamboo. *Rhizomes* short, sympodial. *Culms* 3–5 m long, 3–6 mm diam., at first erect then scandent and climbing. *Internodes* 28–52 cm long, the basal ones 7–25 cm long, cylindrical, pithy in the middle with longitudinal air canals toward the epidermis, scabrid, covered by short, retrorse, strigose hairs. *Bud* one per node, positioned 2–3 mm above the nodal line, terminal to a slight promontory. *Branching* at mid-culm nodes intravaginal, with one primary central branch and 2–4 smaller, secondary branches on a promontory 2–4 mm long. *Culm leaves* erect and appressed to culm, stramineous; *sheaths* 3.5–5 cm long, 1–1.5 cm wide, adaxially glabrous, abaxially puberulous to glabrous, margins papery and smooth, fimbriate at the summit; *fimbriae* weak, short, 2 mm long, curled; *inner ligule* a narrow, stramineous, shiny and ciliolate membrane 0.2 mm wide; *outer ligule* absent; *blades* 1–4 cm long, 0.9–2 cm wide at the base, erect, persistent, mucronate, triangular, inflated at the junction with the sheath, with a coriaceous, darker zone 1–2.5 mm wide at the base, glabrous on both surfaces except pubescent apically and along the margins, the margins ciliate. *Foliage leaves* 9–14 per complement; *sheaths* shorter than or equal to the internode, 2.5–4 cm long, glabrous to glabrescent, striate, bearing fimbriae at the summit, margins papery, ciliolate to smooth; *fimbriae* 5–10 mm long, reddish, smooth, rigid basally, curled apically; *inner ligule* 0.8–1 mm long, pubescent and ciliate; *outer ligule* ca. 0.2 mm long, glabrous, shiny and ciliolate; *pseudopetiole* 2–5 mm long, twisted, adaxially dark green and hispidulous, abaxially yellowish and glabrous, extending 1.5–2 mm onto the lower surface of blade as a triangular patch; *blades* (6–)12–15(–18.5) cm long, 2–5 cm wide, ovate-lanceolate, glabrous and conspicuously tessellate on both surfaces, abaxially with the apex covered by appressed, transparent hairs, the midnerve yellowish, only manifest basally, the base slightly truncate, the apex shortly acu-



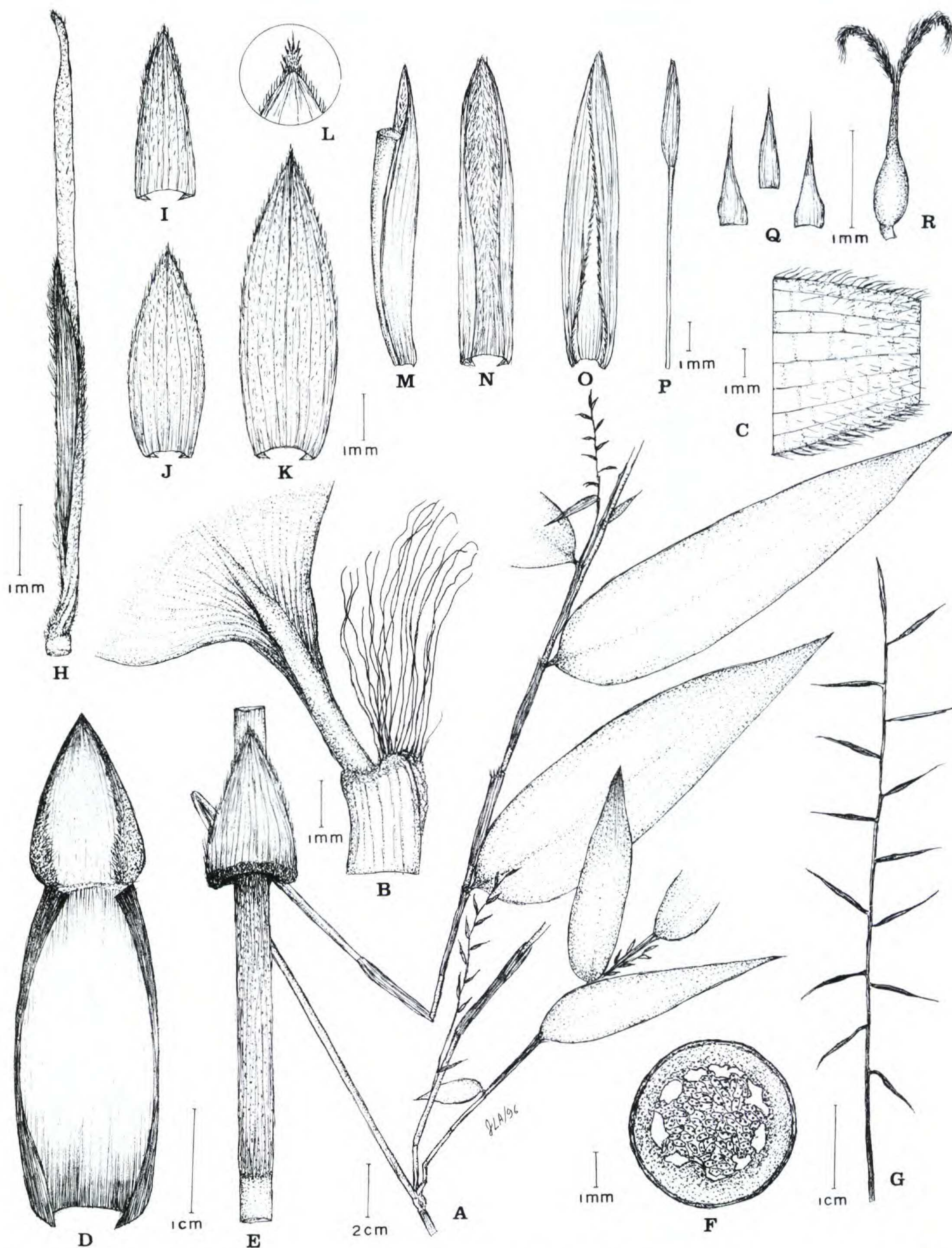


Figure 2. *Arthrostylidium chiribiquetensis* Londoño & L. G. Clark. —A. Flowering branch complement. —B. Foliage leaf, ligular area. —C. Detail of blade showing tessellate venation and adpressed hairs toward the apex. —D. Culm leaf, adaxial view. —E. Culm leaf *in situ*, showing the inflated junction of the blade and the sheath. —F. Cross section of culm showing peripheral air canals. —G. Synflorescence. —H. Spikelet. —I, J. Glumes, abaxial views. —K. Lemma, abaxial view. —L. Apex of lemma, showing prickly mucro. —M. Palea, side view. —N, O. Palea, adaxial and abaxial views. —P. Terminal rudimentary floret. —Q. Lodicules. —R. Gynoecium. (A, C, G–R based on *Palacios et al.* 2681; B, D, E based on *Palacios et al.* 2809; F based on *Cardiel et al.* 1304.)



minate. *Synflorescences* usually terminating leafy branches of all orders or borne directly from nodes, consisting of 2–5 cincinni, these separated by internodes 4–8.5 cm long. *Cincinni* 8–17 cm long, erect, each consisting of 1 subtending bract, 1 prophyll, 1–2 gemmiparous bracts, and 10–18 multiflowered spikelets, these separated by internodes (0.2–)0.5–1 cm long, the axis striate, straight to slightly twisted, glabrous to hispidulous, sulcate above each spikelet; *subtending bract* throughout the main axis like a fully developed branch leaf with fimbriae at the summit, usually with a persistent blade, varying to a narrowly triangular bract 1.5–2.7 cm long, 3–4 mm wide, 13–14-nerved, glabrous, shortly mucronate, papery and ciliate on the margins; *prophyll* (4–)9–18 mm long, 0.8–2.5 mm wide, yellowish, glabrous to hispidulous, 2-keeled, 1-nerved between the keels, 2-nerved on each enfolding margin, the apex with a tuft of hairs, the margins sparsely ciliate to smooth; the keels winged, the wings 0.2–0.4 mm wide, ciliate; *lower gemmiparous bract* 11–20 mm long, 1–2.5 mm wide, stramineous, glabrous, with a tuft of hairs at the apex, 10–14-nerved, shortly mucronate, the mucro 0.1 mm long, subapical, prickly; *upper gemmiparous bract* 18–25 mm long, 2–3 mm wide, 8–16-nerved, developing a small, adaxially pubescent blade, 2–4 mm long, pseudopetiolate or not, sheath glabrous, bearing fimbriae at the summit. *Spikelets* (5–)9–17 mm long, 0.6–0.8 mm wide, slenderly lanceolate, green-yellowish when young then stramineous, pedunculate, the peduncle 0.5–1 mm long, hispidulous, adaxially pulvinate, divergent (60–)75–130° from the main axis, consisting of 0–2 gemmiparous bracts, 1–2 glumes, 2–3 fertile florets, and a terminal rudimentary floret; *rachis* segments  $\frac{1}{2}$  to  $\frac{1}{5}$  the length of the floret, the internodes between glumes 0.7–1 mm long, between florets 6.5–7 mm long, prolonged up to 7.5 mm past the last lemma, smooth except the scabrid margins, flat, disarticulating just below the next lemma; *glumes* 1–2, unequal, triangular, acute to slightly mucronate, margins ciliate, adaxially glabrous with appressed, hyaline hairs at the upper  $\frac{1}{3}$ , abaxially pubescent, 5–7-nerved, the midnerve prominent; lower glume 3–4 mm long, 1.1–1.4 mm wide; upper glume 4.3–5.5 mm long, ca. 1.5 mm wide; *lemmas* 5.5–8.5 mm long, 2–2.5 mm wide, shorter than or equal to the palea, 7–8-nerved, ovate-lanceolate, mucronate, the margins papery basally, ciliate in the upper  $\frac{1}{2}$ , abaxially pubescent, covered by strigose, antrorse, short, transparent hairs, adaxially glabrous and shiny with appressed transparent hairs on the upper  $\frac{1}{3}$ , the mucro prickly, 0.3 mm long; *palea* 6.5–8.1 mm

long, 0.5–1 mm wide, usually equaling or slightly longer than the lemma, 2-keeled, 1-nerved between the keels, each margin 2-nerved, densely pubescent between the keels, the margins glabrous and ciliate, the apex with a conspicuous tuft of hyaline hairs. *Lodicules* 3, 1.5 mm long, 0.3 mm wide, membranaceous, brownish, vasculated, abaxially pubescent, ciliate on the margins. *Stamens* not seen. *Ovary* fusiform, glabrous, 0.7–1 mm long; style 1, ca. 0.5 mm long; stigmas 2, plumose, 1.5 mm long, lighter in color than ovary. *Fruit* not seen.

*Distribution.* Southeastern Colombia; known from only a few collections in the Serranía de Chiribiquete, Dept. of Caquetá, expected to occur in the Dept. of Guaviare; lowland *terra firme* rainforest; 600–650 m.

*Arthrostyloidium chiribiquetensis* can be distinguished by its pithy, canaliculate and scabrid culms; basally inflated culm leaf blades; conspicuously tessellate foliage leaf blades, with the apex covered by appressed and transparent hairs on the abaxial side; reddish fimbriae 5–10 mm long at the summit of the foliage leaf sheath; and cincinni bearing spikelets divergent up to 130° from the axis. This species shares large, glabrous foliage leaf blades, foliage leaf sheaths shorter than internodes, racemiform paraclades, and pedunculate spikelets with *A. grandifolium* (Judziewicz & Clark, 1993). These two species have the largest blades so far known in the genus.

The Serranía de Chiribiquete occurs within the Colombian Guayana, which is geologically and phytogeographically related to the Guayana region (Sanchez P. et al., 1990; Estrada & Fuertes, 1993). This implies that *A. chiribiquetensis* may be most closely related to species of *Arthrostyloidium*, such as *A. scandens*, from the Guayana region, but a more formal analysis of relationships within the genus is needed to test this hypothesis.

*Paratypes.* COLOMBIA. **Caquetá:** Parque Nacional Natural Chiribiquete, base de los cerros cercanos al abrigo norte del campamento base, bosque de *Cespedesia*, 25 nov. 1992 (fl), Barbosa, Cortes, Palacios & Rangel 8039 (COL); alrededores del campamento base, 0°56'15"N, 72°42'06"W, bosque denso de 20 m de alto, 645 m, 24 nov. 1992 (fl), Cardiel, Pedrol, Tellería & Velayos 1304 (COL, MA); alrededores del refugio de la selva, 1°4'23"N, 72°44'W, en suelo de selva alta, 630 m, 1 dic. 1992 (fl), Velayos, Cardiel, Pedrol & Tellería 6511 (COL, MA); cerca del campamento base, 0°56'15"N, 72°42'06"W, 600 m, 27 nov. 1992, Palacios, Barbosa, Cortes & Rangel 2809 (COL, MA); Sierra de Chiribiquete, entre el río de los musgos y el arco del triunfo, 1°05'N, 72°40'W, 600–650 m, 18–19 ago. 1992, Franco, Rangel, Palacios & Betancur 3822 & 3878 (COL).



**Arthrostylidium punctulatum** Londoño & L. G. Clark, sp. nov. TYPE: Colombia. Departamento de Santander: Municipio de Charalá, Corregimiento de Virolín, 1850 m, 13 May 1982 (fl), S. Diaz-Piedrahita 3399 (holotype, COL). Figure 3.

Bambusa lignosa. Rhizoma sympodiale pachymorphum. Culmi 4–7 m alti, 5–10 mm diam., cylindrici, cavi; internodia 18–51 cm longa. Folia culmorum maculata; sutura laminorum cum vagina manifeste asymmetrice curvata, unus margo basim versus prolongatum anguste alatum. Ramificatio intravaginalis; rami cujusque nodi 6–8(–12), ramus centralis non dominans. Vaginae foliorum maculatae longifimbriatae; laminae foliorum ovato-lanceolatae, 10–22 × 2–4 cm, adaxialiter glabrae, ad apicem pubescentem ciliatoque. Synflorescentiae ramos terminantes, 2–3 coflorescentibus, spiculae 4–8 multiflorae. Spiculae 2.5–5 cm longae; glumae 2–3; flosculi fertiles 5–10 et anthoecium rudimentale terminale. Ovarium fusiforme, glabrum, ca. 1 mm longum; stylus 1; stigmata 2.

Woody bamboo. *Rhizome* sympodial. *Culms* 4–7 m long, 5–10 mm diam., erect when young, arching and scandent when the branches develop. *Internodes* 18–51 cm long, cylindrical, hollow, smooth, glabrous, green when young becoming slightly maculate with green and yellow spots, the walls 0.5–1 mm thick, thin, splitting easily. *Bud* one per node, triangular, slightly elongated, positioned on a promontory 3–5 mm long. *Branching* at mid-culm nodes intravaginal, the branch complement of 6–8(–12) subequal branches, the primary branch no larger than the secondary branches. *Culm leaves* erect and appressed to the culm, the basal ones persistent and rotting in place, strongly attached by a basal green or purple flange 0.5 cm wide, the middle and upper ones pushed away by developing axillary branches; *sheaths* 7.5–15 cm long, 3–5 cm wide at the base, glabrous, maculate with yellow and purple spots when young, becoming mottled and stramineous, adaxially shiny and tessellate, the margins smooth; *inner ligule* 0.5 mm long, truncate, shiny, brown, abaxially pubescent, adaxially glabrous, asymmetrically curved, ciliolate along the margin; *blades* 5–11 cm long, 1.8–3.2 cm wide at the base, erect, persistent, triangular, adaxially glabrous except pubescent along the margins and the upper 1/3, abaxially pubescent, green, slightly maculate with yellow and green spots when young becoming stramineous, drying rapidly before the sheath, the junction with the sheath an asymmetrically curved line extending nearly all the way down along one side of the sheath and forming a narrowly winged and papery membrane, the margins ciliate, the apex acute to mucronate. *Foliage leaves* 4–6(–9) per complement; *sheaths* maculate, striate, glabrous except puberulous at the margins, with abundant, mi-

nute “papillae,” tessellate near the papery, ciliolate to smooth margins, bearing fimbriae at the summit; *fimbriae* 6–10 mm long, reddish to stramineous, basally rigid and scabrid, apically curled and smooth; *inner ligule* 0.8–1 mm long, pubescent, ciliate; *outer ligule* 0.3–0.5 mm long, glabrous, shiny, stramineous, ciliolate; *pseudopetiole* 4–6(–7) mm long, stout, purplish to black, adaxially hispidulous, abaxially puberulous, extending 2–4 mm onto the lower surface of the blade as a darker triangular patch; *blades* 10–22 cm long, 2–4 cm wide, ovate-lanceolate, striate, pubescent, and ciliate, adaxially glabrous and tessellate, with 4–6 raised, scabrid, submarginal nerves on one side of the lower 1/3, abaxially pilose to glabrous, conspicuously tessellate, the midnerve yellowish, manifest only basally, the base obtuse, the apex narrowly acuminate. *Synflorescences* usually terminating leafy branches of all orders or borne directly from nodes, consisting of 2–3 coflorescences, these separated by internodes (1.5–)2.5–4.5 cm long. *Coflorescences* 10–15 cm long, erect, each consisting of 1 subtending bract, 1 prophyll, 1 gemmiparous bract, and 4–8 multiflowered spikelets, these separated by internodes (0.6–)1.5–2.6 cm long, the axis striate, straight to slightly twisted, hispid, densely so just below the spikelet, sulcate above each spikelet, the segment below the main terminal spikelet elongated up to 3 cm; the peduncle 0.5–1 mm long, hispid; *subtending bract* throughout the main axis like a fully developed branch leaf, with fimbriae at the summit, the blade persistent or deciduous, the sheath 5–6 cm long, maculate; *prophyll* 9–15 mm long, 0.8–1 mm wide, stramineous, hispid, 2-keeled, the apex ciliate, the margins smooth and papery, the keels winged, the wings ca. 0.2 mm wide, ciliate and pubescent; *gemmiparous bract* 11–18 mm long, 1–1.5 mm wide, 5–7-nerved, membranaceous, narrowly triangular, acute, stramineous, glabrous, the margins ciliolate. *Spikelets* 2.5–5 cm long, 0.3–0.6 cm wide, linear-lanceolate, maculate with green spots, pedunculate, consisting of 2–3 glumes, 5–10 fertile florets, and a terminal rudimentary anthecium; *rachis* on lowest internodes between glumes 0.5–0.7 mm long, between florets 3–5 mm long, hispid, disarticulating just below the next lemma; *glumes* 2–3, unequal, stramineous, adaxially glabrous with tiny, hyaline, appressed hairs on the upper 1/3 and along the midnerve, abaxially glabrous except for the scabrid midnerve, the margins ciliate, the cilia more evident on the upper 1/3; *lower glume* 3.5–5.5 mm long, 0.7–2.5 mm wide, triangular, acute, 1-nerved, with the midnerve prominent, asymmetrical and rough; *middle glume* when present 5–7 mm long, 2–3 mm wide, 4–6-



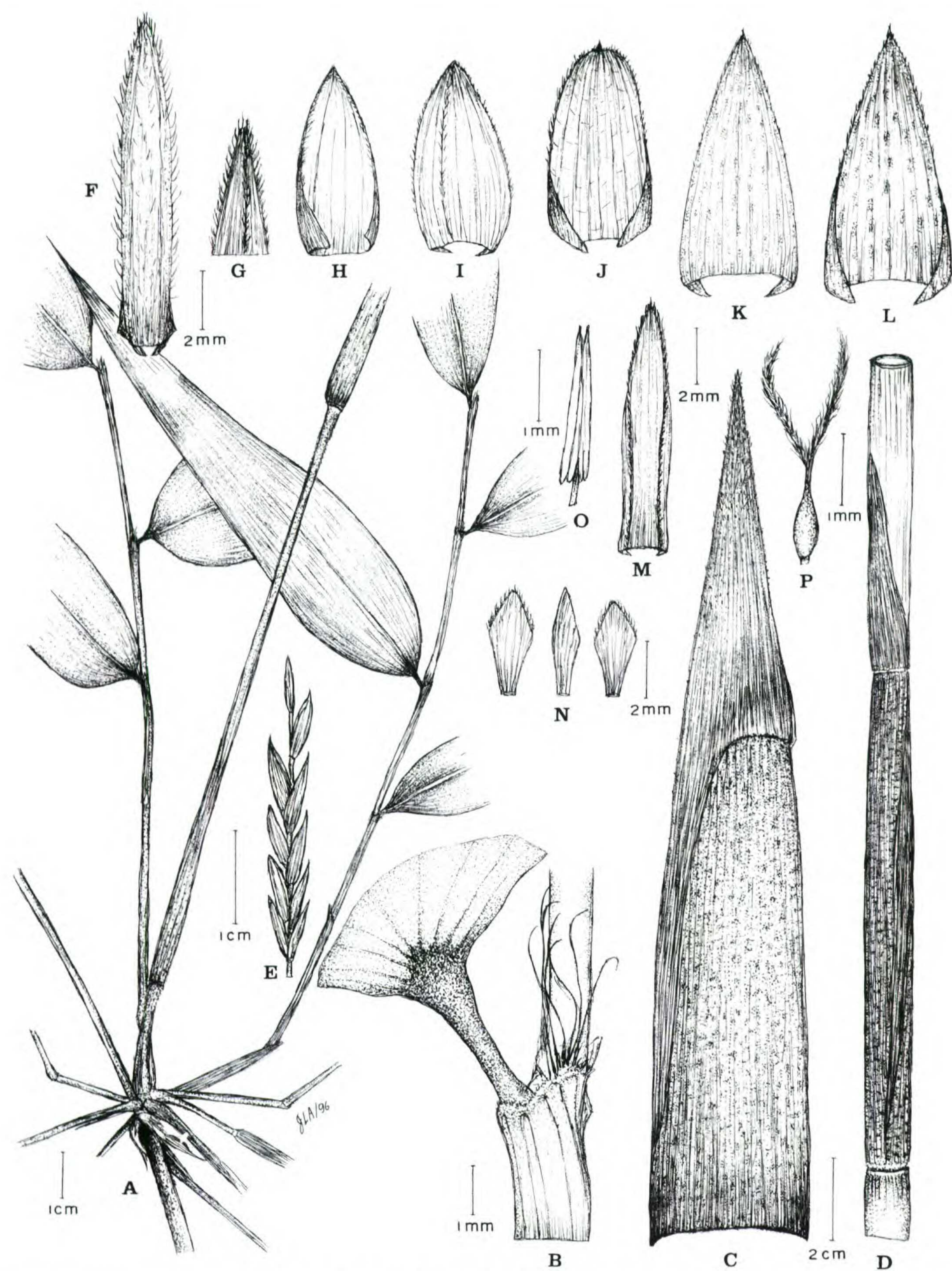


Figure 3. *Arthrostylidium punctulatum* Londoño & L. G. Clark. —A. Branch complement. —B. Foliage leaf, ligular area. —C. Culm leaf, abaxial view. —D. Culm leaf, *in situ*. —E. Spikelet. —F. Prophyll, adaxial view. —G. Lower glume, abaxial view. —H, I. Middle glumes, adaxial and abaxial views. —J. Upper glume, adaxial view. —K, L. Lemma, abaxial and adaxial views. —M. Palea, adaxial view. —N. Lodicules. —O. Anther. —P. Gynoecium. (A–D based on Londoño & Kvist 802; E–P based on Diaz-Piedrahita 3399.)



nerved, lanceolate-ovate, acute-mucronate; *upper glume* 6.5–8 mm long, 2.5–3 mm wide, 7–9-nerved, lanceolate-ovate, mucronate; *lemmas* 9–10.5 mm long, 4–5 mm wide, 7–10-nerved, longer than the palea, ovate-lanceolate, maculate, acute-mucronate, adaxially glabrous except pubescent on the upper  $\frac{1}{3}$ , abaxially glabrous with a patch of hyaline, hispid hairs at the junction with the rachis, margins ciliate; *palea* 8–9.5 mm long, 1.5–1.8 mm wide, the sulcus pubescent, 3-nerved, acute at the apex, 2-keeled, the keels ciliate, the enfolded margins glabrous, 3-nerved. *Lodicules* 3, 2–4 mm long, 0.5–1 mm wide, membranaceous, vasculated, transparent to brownish, ciliate on the margins. *Stamens* 3, the anthers 2–2.5 mm long, brownish, sagittate at the base. *Ovary* fusiform, glabrous, ca. 1 mm long; style 1, 0.2–0.5 mm long, yellowish to brownish; stigmas 2, plumose, 2 mm long. *Fruit* not seen.

**Distribution.** Endemic to the Eastern Cordillera of Colombia in the Department of Santander; montane forests, on white sandy soils, associated with tree ferns, aralias, and clusias; 1800–1900 m.

*Arthrostylidium punctulatum* is named for its very spotted (maculate) culms, culm leaves, foliage leaf sheaths, and spikelets. This species is also characterized by culm leaves with the junction between sheath and blade an asymmetrically curved line, extending nearly all the way down along one side of the sheath; branch complement with a non-dominant primary central branch; and spikelets 2.5–5 cm long with 2–3 basal glumes and a hispid rachis. This species is most similar to *A. longiflorum* Munro, with which it shares smooth, hollow culms; culm leaves slightly maculate when young with the blade drying rapidly before the sheath; large, striate foliage leaf blades; large spikelets; and paleas smaller than the lemmas and with a pubescent sulcus and ciliate keels.

Subequal branches and a strongly asymmetrical junction of the culm leaf sheath and blade are found in several species of *Rhipidocladum* (Clark & Londoño, 1991). This species, however, lacks the triangular shield and apiculate branching characteristic of *Rhipidocladum*, and thus is most appropriately classified within *Arthrostylidium*.

**Paratypes.** COLOMBIA. **Santander:** Charalá, Corregimiento Virolín, via Cañaverale-Olival, en inmediaciones del Río Ruicito, 1850 m, 25 Jun. 1993, Londoño & Kvist 802 (COL, TULV); via El Reloj-Berlín, aprox. a 2 km de la Escuela Rural El Reloj, 1860 m, 25 Jun. 1993, Londoño & Kvist 807 (COL, TULV).

**Arthrostylidium virolinensis** Londoño & L. G. Clark, sp. nov. TYPE: Colombia. Depto. Santander: Mpio. Charalá, Corregimiento Virolín, camino a Olival, Vereda Cañaverale, 1800 m, 13 feb. 1983, S. Diaz-Piedrahita 4048 (holotype, COL). Figure 4.

*Bambusa lignosa*. Rhizoma sympodiale. Culmi 2–3 m longi, 1–3 mm diam., delicati, scandentes; internodia (1.5–)7–21 cm longa. Folia culmorum 3–6.5 cm longa, erecta, appressa. Ramificatio intravaginalis; rami cujusque nodi 10–17, ramus centralis dominans. Vaginae foliorum hispidae, glabrescentes, fimbriatae; laminae foliorum (1–)2.5–3.5(–4.5) cm longae, 0.2–0.45 cm latae, lineari-lanceolatae, glabrae, ad apicem ciliatae. Synflorescentiae ramos terminantes, 1–2 cincinnatis, spiculae 1–3(–4) multiflorae. Spiculae 1–1.6 cm longae; glumae 2; flosculi fertiles 3–4(–5) et anthoecium rudimentale terminale. Ovarium fusiforme, glabrum, 0.5–1 mm longum; stylus 1; stigmata 2.

Climbing woody bamboo. *Rhizome* short, sympodial. *Culms* 2–3 m long, 1–3 mm diam., delicate, scandent, vining, whiplike, purplish green when young, becoming yellowish green. *Internodes* (1.5–)7–21 cm long, cylindrical, glabrous, tuberculate, solid or with a very small lumen less than 0.2 mm diam. *Bud* one per node, terminal to a slight promontory. *Branching* at mid-culm and upper culm nodes intravaginal; branch complement with 1 or 2 larger branches and 9–15 smaller, secondary branches on a promontory 1–2 mm long, the lowermost branch complement developing adventitious roots at the base. *Culm leaves* 3–6.5 cm long, green when young then stramineous, erect and appressed to culm, the basal ones persistent and rotting in place; *sheaths* 2–4 cm long, 0.45–0.8 cm wide, abaxially hispid, strongly attached at the base to an expanded, darker, retrorsely silky-pubescent flange 1 mm wide, the margins smooth and papery basally, fimbriate at the summit; *fimbriae* few, 1 mm long, curled, readily deciduous; *inner ligule* a horizontal, glabrous, ciliate membrane 0.2 mm long; *blades* 0.9–2.1 cm long, 0.1–0.2 cm wide, erect, persistent, triangular, acute-mucronate, adaxially puberulous to glabrous, abaxially hispid. *Foliage leaves* 8–12 per complement; *sheaths* hispid, becoming glabrous, striate, the overlapping margin ciliate for the upper  $\frac{1}{3}$ , fimbriate at the summit; *fimbriae* 3–5 mm long, ivory to stramineous, smooth, basally rigid, apically wavy; *inner ligule* 0.1–0.2 mm long, glabrous, ciliate; *outer ligule* 0.2 mm long, glabrous, stramineous; *pseudopetiole* 0.8–1 mm long, purplish when young becoming yellowish, twisted, hispidulous on both surfaces; *blades* (1–)2.5–3.5(–4.5) cm long, 0.2–0.45 cm wide, linear-lanceolate, glabrous on both surfaces, the apex acute, ciliate, with a tuft of transparent hairs at the tip, adaxially with 2(–3)



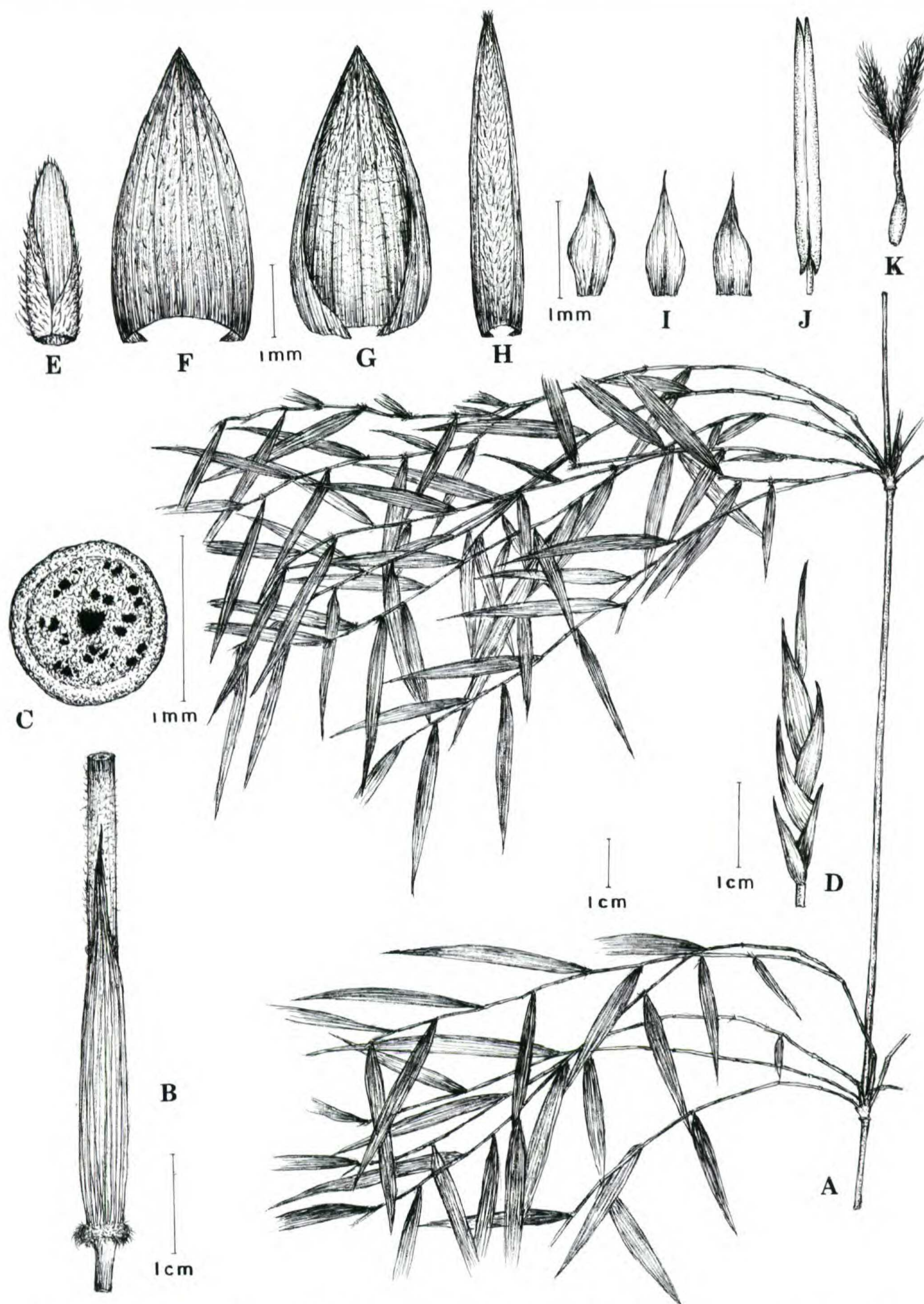


Figure 4. *Arthrostylidium violinensis* Londoño & L. G. Clark. —A. Branch complement. —B. Culm leaf *in situ*, showing a basal pubescent flange. —C. Cross section of culm showing small lumen. —D. Spikelet. —E. Glume, adaxial view. —F, G. Lemma, abaxial and adaxial views. —H. Palea, adaxial view. —I. Lodicules. —J. Anther. —K. Gynoecium. (A and C based on Londoño & Kvist 803; B based on Londoño & Kvist 823; D–K based on Díaz-Piedrahita 4048.)



raised, scabrid, submarginal nerves on one side, abaxially lighter green except when young with a blue stripe along one margin, the margins scabrous, the midnerve yellowish. *Synflorescences* usually terminating leafy branches of all orders or borne directly from the nodes, consisting of 1–2 cincinni, these separated by internodes 5–7 mm long. *Cincinni* 3–4 cm long, each consisting of 1 subtending bract, 1 prophyll, 1 gemmiparous bract, and 1–3(–4) multiflowered spikelets, these separated by internodes 5–7 mm long, the axis hispid, striate, straight to slightly twisted, sulcate above each spikelet, flexuous, bending abruptly 90° above the second spikelet; *subtending bracts* throughout the main axis like a fully developed branch leaf with fimbriae at the summit; *prophyll* 2–3 mm long, 1 mm wide, stramineous, 2-keeled, the keels ciliate and winged; *gemmiparous bract* 1, ca. 5 mm long, 1.5–2 mm wide, 3-nerved, triangular, abaxially hispid, the midnerve strong, the apex covered by hyaline hairs. *Spikelets* 1–1.6 cm long, 1.5–4 mm wide, purple in color, consisting of 2 glumes, 3–4(–5) fertile florets, and a terminal rudimentary antheridium, pedunculate, the peduncle 0.5–0.6 mm long, hispid; *rachis* 1.5–2 mm long, adaxially hispid, abaxially glabrous, disarticulating just below the next lemma; *glumes* 2, unequal, purplish to stramineous, triangular, obtuse, adaxially glabrous except on the upper 1/3 covered by appressed transparent hairs, abaxially hispid, the margins smooth except on the upper 1/3, the midnerve glabrous; *lower glume* 1.5–2.5 mm long, 0.5–0.8 mm wide, 3-nerved; *upper glume* 2.5–3 mm long, 1–1.8 mm wide, 5-nerved; *lemmas* 4–4.5 mm long, 2–2.5 mm wide, equal or shorter than the paleas, 5–6-nerved, ovate-lanceolate, purplish on both surfaces, darker and tessellate adaxially, abaxially hispidulous to glabrous, adaxially glabrous except on the upper 1/3, the apex acute, the overlapping margin ciliolate on the upper 1/3, the midnerve prominent, ending before the tip; *palea* 4.5–5 mm long, 0.5–0.8 mm wide, purplish, the sulcus pubescent otherwise glabrous and shiny, 2-keeled, the keels glabrous, the apex with a tuft of hyaline hairs, the enfolded margins glabrous, shiny, and membranaceous. *Lodicules* 3, 1–1.5 mm long, ca. 0.5 mm wide, lanceolate, acuminate-attenuate, transparent to yellowish, vasculated, with 1–3 distinct brown nerves, the margins smooth. *Stamens* 3, the anthers 2.5–3 mm long, whitish to stramineous. *Ovary* fusiform, glabrous, 0.5–1 mm long, yellowish; style 1, 0.3–0.5 mm long, yellowish to brownish; stigmas 2, 1–1.5 mm long, plumose, whitish to stramineous. *Fruit* not seen.

*Distribution.* Apparently restricted to the Eastern Cordillera of northeastern Colombia, in the Department of Santander; mossy montane forest edges, associated with aroids, bromeliads, ferns, Piperaceae, and seedling palms; 1800–1900 m.

*Arthrostylidium virolinensis* is most similar to *A. sarmentosum* Pilger, *A. venezuelae* (Steudel) McClure, and *A. ecuadorensis* Judziewicz & L. G. Clark, which share a climbing and scandent habit; delicate, slender culms; small foliage leaf blade size; pubescent and fimbriate foliage leaf sheaths; zig-zag/flexuous synflorescences; and paleas as long as to slightly longer than the lemmas. *Arthrostylidium virolinensis* is sympatric only with *A. venezuelae*, but the overall similarity in habit and synflorescence morphology has led to confusion among these species. The four are compared and contrasted in Table 1. Although zig-zag synflorescences are known in *Rhipidocladum* (Clark & Londoño, 1991), this character may be a synapomorphy for these four species within *Arthrostylidium*.

*Arthrostylidium virolinensis* is distinguished from the other three species by its obtuse glumes with smooth midnerves, lemmas 4–4.5 mm long, and purplish paleas with glabrous keels (Table 1). Vegetatively, the culm leaves are much shorter than those of *A. sarmentosum* and *A. venezuelae*, whereas the culm leaves of *A. ecuadorensis* have reflexed blades. The foliage leaf blades of *A. virolinensis* are the narrowest (0.2–0.45 cm) of any of the species in this group (Table 1). The contrasts between *A. virolinensis* and *A. venezuelae* are evident in foliage leaf length and width, number of spikelets per cincinnus, number of glumes per spikelet, and lemma length (Table 1).

*Paratypes.* COLOMBIA. **Santander:** Mpio. Charalá, Corregimiento Virolín, via Cañaverale-Olival, en inmediaciones del río Ruicito, 1820 m, 25 jun. 1993, Londoño & Kvist 803 (COL, TULV); Mpio. Gambitá, a 1–2 km de Puente Guillermo por la vía Charalá-Duitama, 1850 m, 27 jun. 1993, Londoño & Kvist 823 (COL, TULV).

***Rhipidocladum abregoensis*** Londoño & L. G. Clark, sp. nov. TYPE: Colombia. Norte de Santander: Mun. Abrego, km 20 via Abrego-Jurisdicciones, 1990 m, 18 Abr. 1994 (fl), X. Londoño, E. Ascanio & S. Rodríguez 881 (holotype, COL; isotypes, ISC, NY, TULV, US). Figure 5.

Bambusa lignosa. Rhizoma sympodiale pachymorphum. Culmi scandentes 4–8 m alti, 1–3(–5) mm diam., cylindrici, cavi; internodiis ad 75 cm longis. Ramuli floriferi 50–100 in quoque nodum, (4.5–)8–21 cm longi. Ramificatio intravaginalis, flabellatis; folia ramulorum (2–)8–15; laminae foliorum planae, lineares, 0.8–2.8(–3.5) × 0.18–0.23 cm, adaxialiter glabrae vel sparsim puberulae, abaxi-



| Table 1. Comparison of <i>Arthrostylidium ecuadorens</i> , <i>A. sarmentosum</i> , <i>A. venezuelae</i> , and <i>A. virolinensis</i> . |  |  |   |                        |
|--|--|--|---|------------------------|
| Character  | <i>A. ecuadorens</i>                                       | <i>A. sarmentosum</i>                                    | <i>A. venezuelae</i>                                      | <i>A. virolinensis</i> |
| Internode texture  | retorsely scabrid<br>with fragile glossy<br>prickles above | glabrous   | glabrous  | glabrous               |
| Culm leaf length (cm)  | ca. 4.5  | 7.5–20   | 15–25   | 3–6.5                  |
| Culm leaf blade position   | reflexed   | erect  | erect   | erect                  |
| Foliage leaf blade length (cm)   | (3.8–)5–10   | 4–6  | 7–14.5  | (1–)2.5–3.5(–4.5)      |
| Foliage leaf blade width (cm)  | 0.8–1.3  | 0.4–0.6  | (0.7–)0.9–1.4   | 0.2–0.45               |
| Number of spikelets per<br>paraclade   | 3–6  | 3–5  | (4–)5–8   | 1–3(–4)                |
| Spikelet length (cm)   | 2.5–4  | 1.6–1.8  | 1–1.7(–3)   | 1–1.6                  |
| Number of fertile florets<br>per spikelet  | 5–9  | (2–)4–5  | 3–4   | 3–4(–5)                |
| Number of glumes per<br>spikelet   | 3  | 2–3  | 3   | 2                      |
| Glume shape  | acute  | acute to apiculate                                       | acute, shortly mu-<br>cronate                             | obtuse                 |
| Glume midnerve pubes-<br>cence   | scabrous   | scabrous   | scabrous  | glabrous               |
| Lemma length (mm)  | (6–)8–10(–13)  | 6–7  | (5–)7–10  | 4–4.5                  |
| Palea color  | ?  | yellowish to strami-<br>neous with pur-<br>plish margins | stramineous, occa-<br>sionally with pur-<br>plish margins | purplish               |
| Palea keel pubescence  | ciliolate  | ciliolate  | ciliolate   | glabrous               |

aliter glabrae vel breviter pilosae. Synflorescentiae racemiformes, tenues. Spiculae 2–4, 3.3–6 cm longae; glumae 2, aristatae, gluma prima 4.5–6 mm longa, arista 1–1.5 mm longa; secunda 7–9 mm longa, arista 2–3 mm longa; flosculi fertiles 3–5 et anthoecium rudimentale terminale; lemma 12–18 mm longa, 7-nervata, abaxialiter pubescens, arista 4–8 mm longa; paleae 7.2–9 mm longae, breviores quam lemma, carinae 2, purpurea. Ovarium fusiforme, glabrum, ca. 0.7 mm longum; stylus 1; stigmata 2.

Woody bamboo. *Rhizomes* sympodial, short. *Culms* 4–8 m long, 1–3(–5) mm diam., delicate, scandent and clambering. *Internodes* up to 75 cm long, hollow with a small lumen, cylindrical, glabrous, green, maculate with yellowish spots when young becoming all yellow. *Nodal line* expanded into a corky, pubescent, brown, flangelike extension 0.8–1 mm wide; *bud* one per node, positioned 0.5–1 mm above the nodal line. *Branching* intravaginal, with 50–100 subequal branches arising in a fan-shaped or apsidate branch complement; often 1 or 2 branches slightly larger than the others and re-branching. *Culm leaves* erect and appressed to the culm on the lower 1/3 of the culm, deciduous, narrowly triangular; *sheaths* 4–5 cm long, 1–3.5 cm wide, abaxially puberulous, adaxially glabrous, shiny, tessellate, the margins smooth; *inner ligule* a horizontal, truncate membrane 0.2 mm long; *outer ligule* absent; *blades* ca. 1 cm long, erect, decidu-

ous. *Foliage leaves* (2–)8–15 per complement (2–3 on flowering branches); *sheaths* striate, glabrous abaxially, bearing fimbriae at the summit, the overlapping margin densely pilose, the other one pilose; *fimbriae* 4–6 mm long, ivory to stramineous, smooth, basally curved, apically straight to wavy; *inner ligule* 0.2–0.3 mm long, membranaceous, ciliate; *outer ligule* 0.1–0.2 mm long, yellowish, ciliate; *pseudopetiole* 0.8–1 mm long, yellowish to brownish, hispidulous on both surfaces; *blades* 0.8–2.8(–3.5) cm long, 0.18–0.23 cm wide, linear-lanceolate, adaxially glabrous to sparsely puberulent, with 2–3 raised, scabrid, submarginal nerves on one side, abaxially glabrous to short pilose, the midnerve yellowish, manifest basally, the apex acute-mucronate, covered by strigose, transparent hairs, the margins scabrous, becoming ciliate near the apex. *Synflorescences* racemiform, terminating leafy branches of all orders or borne directly from the nodes, (4.5–)8–21 cm long, slightly curved, bearing 2–4(–5) ascending, nonsecund, multiflowered spikelets, these separated by internodes 1–2.6 cm long; *main axis* straight, hispid, densely pubescent at the apex, sulcate above each spikelet. *Spikelets* (including awns) 3.3–6 cm long, 2–3 mm wide, linear-lanceolate, shortly pedunculate, purplish to



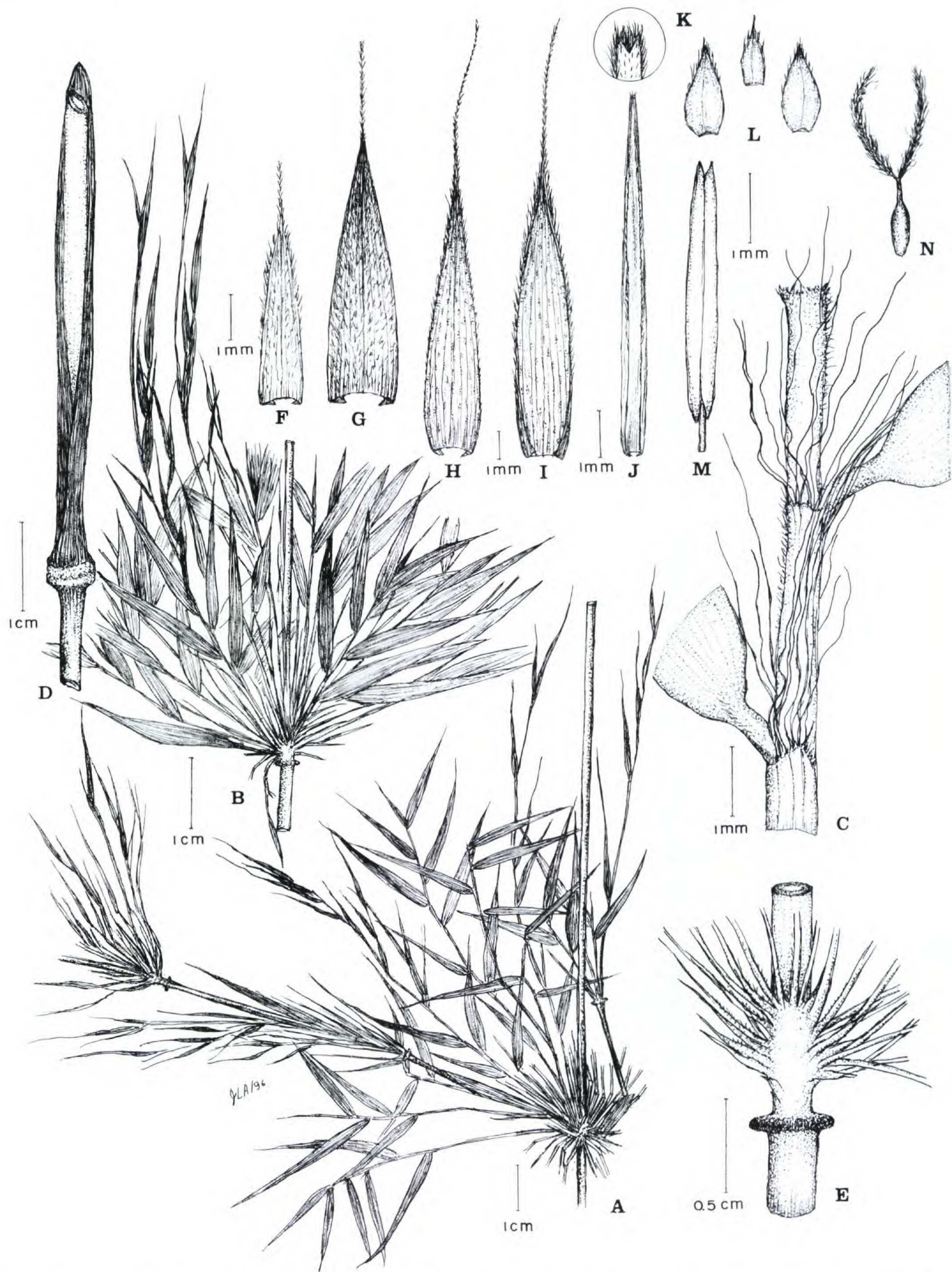


Figure 5. *Rhipidocladum abregoensis* Londoño & L. G. Clark. —A, B. Flowering branch complements. —C. Foliage leaf blade, ligular area. —D. Culm leaf *in situ*. —E. Culm node with branch complement. —F, G. Glumes, abaxial views. —H, I. Lemma, abaxial and adaxial views. —J. Palea, adaxial view. —K. Apex of palea showing ciliate margins and tuft of hairs at the bifid tip. —L. Lodicules. —M. Anther. —N. Gynoeceium. (A–N based on *Londoño et al.* 881.)



Table 2. Comparison of *R. abregoensis*, *R. panamense*, and *R. sibilans*.

| Character                                     | <i>R. abregoensis</i> | <i>R. panamense</i>                       | <i>R. sibilans</i> |
|---|-----------------------|---|--------------------|
| Culm diameter (cm)                            | 0.1–0.3(–0.5)         | 0.5–0.7                                   | to 1.5             |
| Culm leaf blade apex                          | acute                 | ?   | long acuminate     |
| Nodal flange                                  | present               | absent                                    | absent             |
| Number of branches per node                   | 50–100                | 200–230                                   | 150–200            |
| Foliage leaf sheath fimbriae length (mm)      | 4–6                   | ca. 2                                     | 1–3                |
| Foliage leaf blade length (cm)                | 0.8–2.8(–3.5)         | 3–6                                       | 5–7                |
| Foliage leaf blade width (cm)                 | 0.18–0.23             | 0.2–0.3                                   | 0.18–0.27(–0.35)   |
| Adaxial foliage leaf blade pubescence         | glabrous              | pubescent with strigose transparent hairs | glabrous           |
| Number of strong marginal nerves on the blade | 2–3                   | 1   | 1(–2)              |
| Number of spikelets per paraclade             | 2–4(–5)               | 5–7                                       | 2–3                |
| Spikelet length (mm)                          | 3.3–6                 | 1.2–1.6                                   | 2–4                |
| Number of fertile florets per spikelet        | 3–5                   | 2   | 2–3                |
| Number of glumes per spikelet                 | 2                     | 3   | 4–5                |
| Adaxial glume pubescence                      | glabrous              | pubescent toward the apex                 | ?                  |
| Lemma body length (mm)                        | 9–10                  | 5.5–6                                     | ca. 10             |
| Palea color                                   | purplish              | yellowish to stramineous                  | ?                  |
| Palea keels                                   | not winged            | winged                                    | winged             |

stramineous mottled with dark green spots, consisting of 2 glumes, 3–5 fertile florets, and a terminal rudimentary antherium, the peduncle 0.3–0.5 mm long, pubescent; *rachis* between glumes 0.5–0.7 mm long, between florets 5–7 mm long, smooth, with dark green spots on the upper 1/3, disarticulating just below the next lemma; *glumes* 2, unequal; awned, stramineous, adaxially glabrous, abaxially pubescent, the awn scabrous, the margins ciliate on the upper 1/3; *lower glume* 4.5–6 mm long, 0.7–1.5 mm wide, linear-lanceolate to lanceolate, the midnerve prominent, asymmetrical, and brownish, the awn 1–1.5 mm long; *upper glume* 7–9 mm long, 1.2–2 mm wide (including awn), 7-nerved, linear-lanceolate, the awn 2–3 mm long; *lemmas* 12–18 mm long, 2–2.2 mm wide, 7-nerved, linear-lanceolate, awned, light purplish to stramineous mottled with darker spots, adaxially glabrous and tessellate, abaxially pubescent, the margins ciliate except on the lower 1/3, the awn 4–8 mm long, scabrous; *palea* 7.2–9 mm long, 0.3–0.6 mm wide, smaller than the lemma, purplish, 2-keeled, the keels minutely ciliate except on the lower 1/3, the sulcus puberulent, the enfolded margins glabrous, 3-nerved, papery and shiny toward the margins. *Lodicules* 3, narrowly ovate, acuminate, glabrous, transparent, membranaceous, vasculated, ciliate on the margins, the posterior one 0.8 mm long, the anterior pair 1.2–1.5 mm long. *Stamens* 3, the anthers 3.8–4.5 mm long, yellowish to stramineous,

linear. *Ovary* fusiform, glabrous, ca. 0.7 mm long, yellowish; style 1, 0.3 mm long, lighter than the ovary; stigmas 2, plumose, 2 mm long. *Fruit* not seen.

*Distribution.* Endemic to the Eastern Cordillera of Colombia; deforested areas along the road; ca. 1990 m.

*Rhipidocladum abregoensis* is named for its type locality, where a number of bamboos occur, including the recently discovered *Otatea* and several species of *Chusquea*. This new species is classified as a member of *Rhipidocladum* sect. *Racemiflorum* L. G. Clark & Londoño because of its smaller size, scandent and clambering habit, and aristate glumes (Clark & Londoño, 1991). Its very sparsely flowered, nonunilateral arrangement of spikelets in the synflorescence, slender, terete, awned spikelets, and mottled lemmas are unusual in *Rhipidocladum* (Judziewicz et al., 1991). These features are shared with *R. panamense* R. W. Pohl and *R. sibilans* Davidse, Judziewicz & L. G. Clark, species with which the new species is compared and contrasted (Table 2). These three species also share very narrow foliage leaf blades. As far as is known, these species are not sympatric, but they may form a group within the genus based on their morphological similarities.

According to its original description (Pohl, 1985), *R. panamense* has unilateral synflorescences. In all the specimens of this species exam-



ined at US, this species has nonunilateral synflorescences with spikelets borne 5–20 mm apart.

*Rhipidocladum abregoensis* is distinguished by the presence of a nodal flange (Fig. 5E); rebranching of a few of the secondary branches per complement (Fig. 5A); well-developed fimbriae on the foliage leaf sheath summits; foliage leaf blades with 2–3 strong marginal nerves; spikelets 3.3–6 cm long; two glumes per spikelet; purplish paleas; and unwinged palea keels (Table 2). *Rhipidocladum abregoensis* is similar to *R. panamense* based on its slender culms, but has fewer branches per node, shorter foliage leaf blades with 2–3 strong marginal nerves, fewer spikelets per synflorescence, fewer florets per spikelet, adaxially glabrous glumes, and lemmas 9–10 mm long (Table 2), in addition to the distinguishing features listed above. *Rhipidocladum abregoensis* is easily distinguished from *R. sibilans* by its smaller culms, acute culm leaf blades, shorter foliage leaf blades, and two glumes per spikelet (Table 2).

The one or two slightly larger, rebranching secondary branches (Fig. 5A) noted in this species are unique in the genus. All other species of *Rhipidocladum* produce few to many subequal, determinate, secondary branches per node; if these branches rebranch at all, it is from the base to produce another slender leafy branch (Clark & Londoño, 1991). Because *R. abregoensis* is known from only one specimen, additional collections must be observed to determine whether this branching pattern is indeed characteristic of the species. This pattern is also found in three species of *Merostachys* (Sendlusky, 1997), another genus in which the secondary branches typically do not rebranch.

***Guadua angustifolia* Kunth var. *nigra* Londoño, var. nov.** TYPE: Colombia. Quindio: Mpio. Montenegro, ca. 10 km W of Montenegro, 1200 m, 11 mar. 1996, X. Londoño 960 (holotype, COL; isotypes, HUQ, TULV, US).

*Guadua angustifoliae* var. *angustifoliae* affinis, a qua imprimis differt culmo ater.

Woody, thorny bamboo. *Rhizomes* pachymorph. *Culms* 10–20 m tall, 8–12 cm diam., stiffly arched. *Internodes* 13–30 cm long, hollow, green when young, showing dark spots during maturation and turning black with age. *Nodes* solitary, a band of appressed white hairs above and below the nodal line; bud solitary. *Culm leaves* coriaceous, deciduous, triangular; *sheaths* 35–45 cm long, 25–30 cm wide, abaxially strigose, adaxially glabrous and shiny; *blades* 9–12 cm long, 6–8 cm wide, erect, persistent, mucronate at the apex, adaxially con-

spicuously nerved and pubescent between the nerves; *inner ligule* 0.8–1 mm long, ciliolate along the margin; *outer ligule* absent. *Branching* intravaginal; primary branch solitary and armed. *Foliage leaves* 7–9 per complement; *sheaths* glabrous to glabrescent, nonauriculate, bearing fimbriae at the summit; *blades* 10–22 cm long, 0.5–2 cm wide, mostly glabrous on both surfaces, but with sparse, hyaline hairs.

*Guadua angustifolia* var. *nigra* is known only from the type locality, where it grows in a very restricted area at the edge of a creek. It was first discovered by Ever Betancurt, a horticulturally skilled local inhabitant who has devoted his life to the management of guaduales in this region.

***Chusquea antioquiensis* L. G. Clark & Londoño, sp. nov.** TYPE: Colombia. Antioquia: Mun. La Unión, Río Buey, 5.6 km SW of Mesopotamia and 25 km NE of Abejorral, 5°53'N, 75°20'W, 2220 m, 18 June 1994 (fl), L. G. Clark, X. Londoño & N. Giraldo 1232 (holotype, HUA; isotypes, COL, ISC, TULV, US). Figure 6.

Culmi (4–)6–12(–15) m alti, 1.3–5.5 cm diam., erecti ad basim, arcuati et scandentes apicem versus. Internodia 25–42 cm longa ad basim, solida, leviter sulcata. Folia culmorum 38–65 cm longa, triangulares, nodum proximum superantia, persistentes; vaginae 20.5–45.5 cm longae, 1.2–3.5(–4.2)-plo longiores quam laminam, abaxialiter pubescentes vel scabrosae ad basim, scabridae vel glabrae ad apicem; cingulum (1–)3–10 mm latum, pubescenti-hirsutum; laminae 9.7–21 cm longae, erectae, apice setosi-acuminatae vel subulatae. Ramificatio infravaginalis; rami subsidiarii cujusque nodi 50–100, 17–45 cm longi. Folia cujusque complementi 4–7; vaginae glabrae, apice utrinque leviter prolongatae, adnatae ad ligulam internodalem; laminae 17–26.5 cm longae, 0.3–0.7 cm latae, long./lat. = 31–55(–65), apice setosae, basi attenuatae. Synflorescentia 13.5–19 cm longa, paniculata, angusta. Spiculae (7.9–)8.6–10(–11) mm longae; glumae I et II 0.5–0.7 mm longae, obtusae; gluma III 5.3–6.2 mm longa, ½–⅔ longior quam spiculam, breviter aristata; gluma IV 6.2–7.1 mm longa, ca. ⅓ longior quam spiculam, breviter aristata; lemma 7.6–7.9 mm longum, breviter aristatum; palea 7.3–7.6 mm longa.

Woody bamboo. *Culms* (4–)6–12(–15) m tall, 1.3–5.5 cm diam., erect at base, arching above and sometimes scandent in trees. *Internodes* 25–42 cm long in the lower ⅓ of culm, solid, scabrous just below the node and otherwise glabrous or completely glabrous, shallowly sulcate above the bud/branch complement. *Culm leaves* 38–65 cm long, triangular, usually persistent, usually surpassing the next node, the juncture of the sheath and blade abaxially obscure but somewhat acute; *sheaths* 20.5–45.5 cm long, 1.2–3.5(–4.2) times as long as the blade, abaxially pubescent or retrorsely scabrous at the



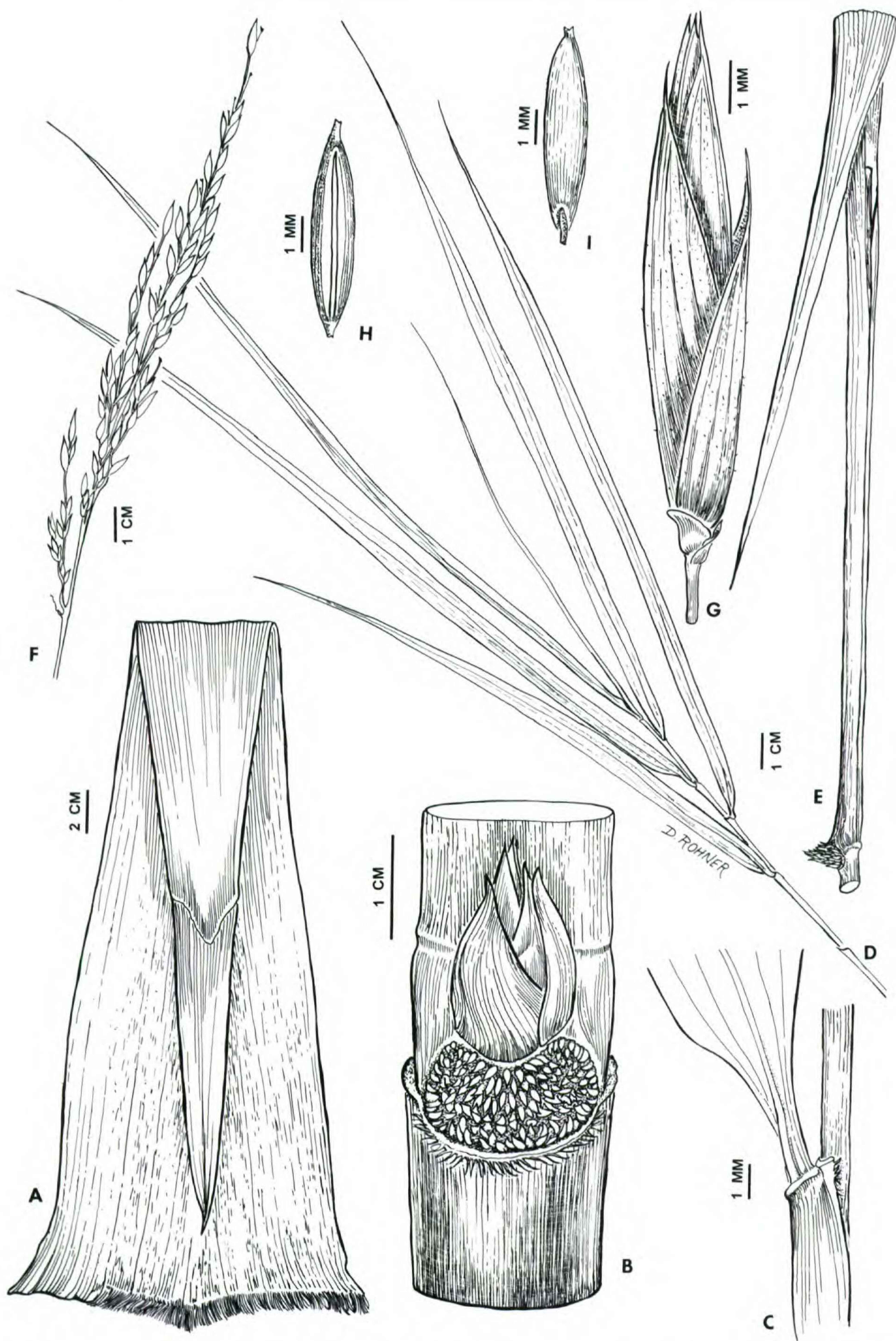


Figure 6. *Chusquea antioquensis* L. G. Clark & Londoño. —A. Culm leaf. —B. Bud complement. —C. Foliage leaf, ligular area. —D. Leaf complement. —E. Culm leaf *in situ*, with emerging branches. —F. Synflorescence. —G. Spikelet. —H, I. Caryopsis, hilum and embryo views. (A, B based on Clark & Londoño 1222; C, D based on Clark & Londoño 1219; E based on Calderón *et al.* 2988; F, I based on Clark *et al.* 1232.)



base, becoming scabrid or glabrous toward the summit, no midrib distinguishable, the overlapping margin sparsely ciliate along most of its length; *girdle* (1–)3–10 mm wide, densely pubescent-hirsute; *inner ligule* 1–2.5 mm long, slightly irregular, completely ciliate or ciliate only toward each margin; *blades* 9.7–21 cm long, nearly strap-shaped, erect, persistent, abaxially retrorsely scabrous, apex setose-acuminate to shortly subulate. *Nodes* at mid-culm with one triangular central bud subtended by numerous subsidiary buds in several rows in constellate arrangement; nodal line horizontal, dipping markedly below the bud/branch complement; supranodal ridge evident about 7–11 mm above the nodal line. *Branching* infravaginal; central branch often developing at mid-culm and higher nodes; leafy subsidiary branches 50–100 per node, 17–45 cm long, usually not rebranching. *Foliage leaves* 4–7 per complement; *sheaths* striate, glabrous,  $\pm$  keeled, the summit slightly prolonged on each side and adnate to the inner ligule, occasionally sparsely ciliate, the overlapping margin ciliate; outer ligule 0.3–0.5 mm long, glabrous; inner ligule 0.5–1.2(–1.7) mm long, rounded or irregular, abaxially pubescent; pseudopetiole 2–3 mm long; *blades* 17–26.5 cm long, 0.3–0.7 cm wide, L:W = 31–55(–65), linear-lanceolate, adaxially retrorsely scabrid, not tessellate, abaxially glabrous, not tessellate or weakly so, the midrib  $\pm$  prominent abaxially, the apex shortly setose to setose, the base attenuate, the margins somewhat prominent, 0.1–0.2 mm wide, cartilaginous, serrulate. *Synflorescences* 13.5–19 cm long, paniculate, narrow; main axis angular, ridged, scabrid, subtended by a small, obtuse bract 1.5–2 mm long but a subtending spathe absent; axes of paraclades angular, scabrid, appressed; peduncles 1.5–5(–9) mm long. *Spikelets* (7.9–)8.6–10(–11) mm long; *glumes* I and II 0.5–0.7 mm long, scalelike, glabrous, obtuse, 1-nerved; glume I no more than  $\frac{1}{20}$  the spikelet length; glume II ca.  $\frac{1}{10}$  the spikelet length; *glumes* III and IV triangular, slightly navicular, shortly aristate, abaxially scabrid between the nerves on the upper  $\frac{1}{2}$ ; glume III 5.3–6.2 mm long,  $\frac{1}{2}$ – $\frac{2}{3}$  the spikelet length, 7-nerved; glume IV 6.2–7.1 mm long, ca.  $\frac{4}{5}$  the spikelet length, 9-nerved; *lemma* 7.6–7.9 mm long, triangular, slightly navicular, shortly aristate, abaxially scabrid between the nerves on the upper  $\frac{1}{2}$ , 9-nerved; *palea* 7.3–7.6 mm long, navicular, abaxially scabrid, sulcate, 2-keeled, 6-nerved. *Lodicules* 3, densely ciliate abaxially and on the margin; the anterior pair ca. 1.1 mm long; the posterior one ca. 0.9 mm long. *Stamens* not seen. *Ovary* not seen. *Fruit* a caryopsis, ca. 4.8 mm long, reddish brown; hilum linear, reddish brown but the area around it golden-brown; embryo small.

*Distribution.* Central Cordillera of Colombia in Antioquia and Caldas; montane forest, persisting in disturbed areas; 2050–2340 m.

This striking species is characterized by its shallowly sulcate internodes; large triangular culm leaves with densely pubescent girdles; infravaginal branching with the central branch frequently developing at mid-culm or higher nodes; numerous subsidiary branches; narrow foliage leaf blades with L:W = 31–55(–65) and setose apices; narrowly paniculate synflorescences; and spikelets (7.9–)8.6–10(–11) mm long with glumes III and IV and the lemma shortly aristate. The infravaginal branching, numerous constellate subsidiary buds/branches, narrow foliage leaf blades, scalelike glumes I and II, and shortly aristate glumes III and IV and the lemmas are characters shared with other members of *Chusquea* sect. *Longifoliae* L. G. Clark (Clark, 1989) within which *C. antioquiensis* is placed. The best developed plants of this species reach 5.5 cm in diameter and upward of 15 m in length, making this one of the largest species in the genus.

The type specimen is the only known collection of this species in flower. Several clumps in the area were blooming, but one nearby clump was vegetative with new shoots. Other collections of this species (Clark *et al.* 1219, 1222) made at the same time were vegetative, indicating that this was not a gregarious blooming event. Copious fruits were produced, and a few seedlings were observed growing near the plant from which specimens were taken.

*Paratypes.* COLOMBIA. **Antioquia:** Mun. La Unión, Abejorral-Mesopotamia-Sonsón road, Río Buey crossing, along both banks, 2260 m, 5°52'N, 75°20'W, 28 Feb. 1988, Clark & Londoño 426 (COL, ISC, TULV, US); Mun. San Vicente, road between San Vicente and Concepción, 12.6 km SW of Concepción, Q. El Cabullo, 2110 m, 6°20'N, 75°17'W, 14 June 1994, Clark, Londoño & Giraldo 1219 (COL, ISC, TULV, US); Mun. Concepción, road from Concepción to Barbosa, 7.5 km NW of Concepción, 2230 m, 6°25'N, 75°17'W, 14 June 1994, Clark, Londoño & Giraldo 1222 (COL, ISC, TULV, US). **Caldas:** Manizales, La Bocatoma, 6 Aug. 1981, Calderón, Clark & Pohl 2988 (ISC, US); Manizales, La Bocatoma SE of Manizales, 2050 m, 10 Feb. 1982, Clark, Clark, Manzur & Londoño 255 (COL, ISC, US); Mun. Villamaria, 15.5 km below Hotel Los Termales del Ruiz, opposite entrance to Termales El Otoño, 5°02'N, 75°27'W, 2340 m, 27 Jan. 1988, Clark & Londoño 372 (COL, ISC, TULV, US).

***Chusquea arachniforme*** L. G. Clark & Londoño, sp. nov. TYPE: Colombia. Antioquia: Mun. Amalfí, Vereda El Guayabito, kms 3–6 de la via Amalfí-El Guayabito, NE de Amalfí, sitio Tabanito, 6°54'N, 75°01'O, 1650 m, 5 dic. 1989 (fl), R. Callejas, J. Betancur & O. D. Escobar 8994 (holotype, HUA; isotypes, COL?, MO). Figure 7.



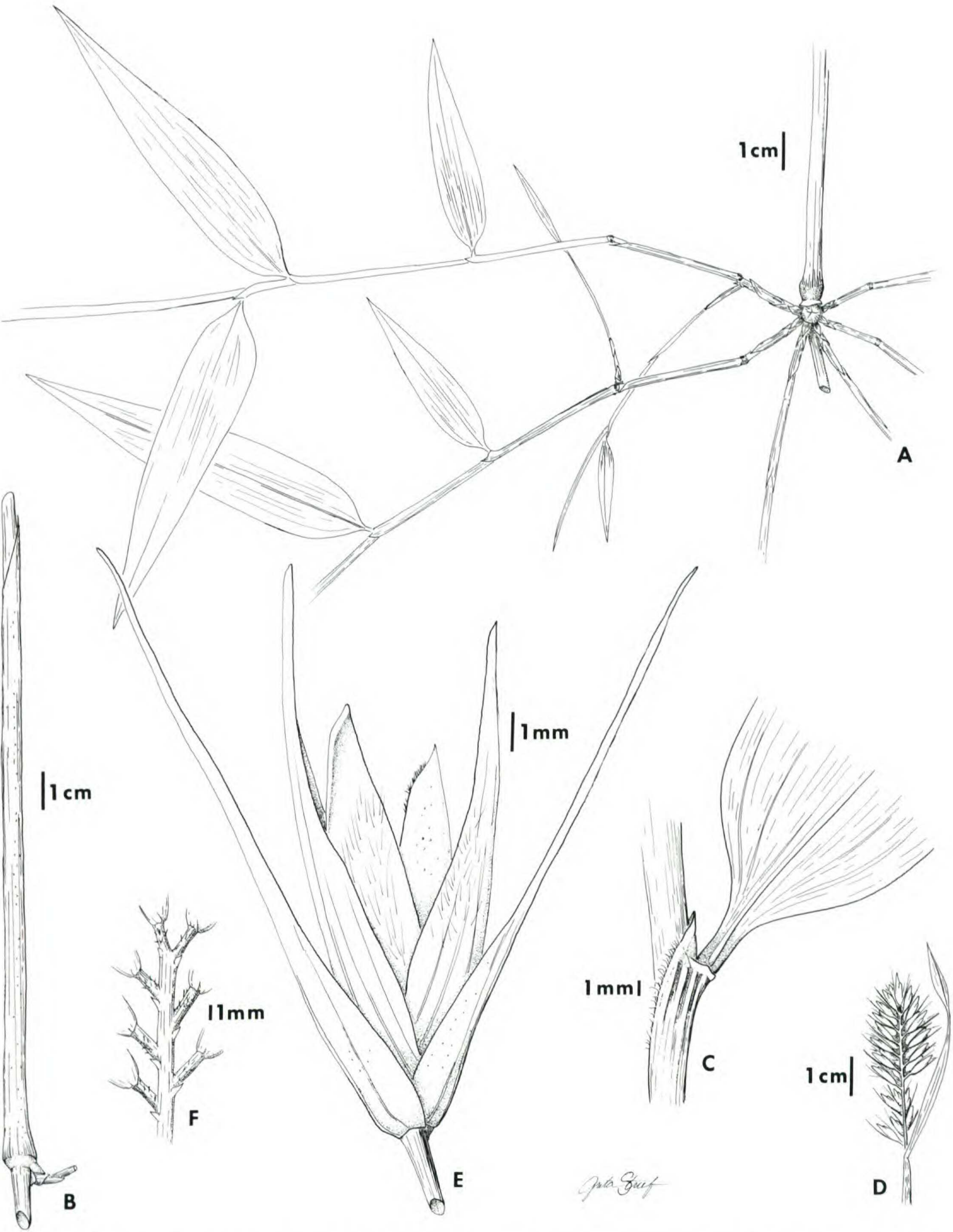


Figure 7. *Chusquea arachniforme* L. G. Clark & Londoño. —A. Branch complement with foliage leaves. —B. Culm leaf *in situ*. —C. Foliage leaf, ligular area. —D. Synflorescence with subtending spathe. —E. Spikelet. —F. Detail of subtending bracts in apical portion of synflorescence. (A–C based on Clark *et al.* 1228; D–F based on Callejas *et al.* 8994.)



Culmi 2–3 m longi, 0.3–0.5 cm diam., scandentes. Internodia 20–28 cm longa, glabra. Folia culmorum 9.4–16.7(–29.3) cm longa, persistentia; vaginae 9–26.5 cm longae, (9.5–)13–26(–47)-plo longior quam laminam, abaxialiter retrorsum scabrae; cingulum 2–5(–10) mm latum, glabrum; laminae 0.3–2.8 cm longae, erectae, persistentes, adaxialiter pubescentes, abaxialiter glabrae. Ramificatio infravaginalis; rami subsidiarii cujusque nodi 5–7, usque ad 20 cm longi, geniculati. Folia cujusque complementi 3–6; vaginae glabrae; laminae 9–14 cm longae, 1.6–2.5 cm latae, long./lat. = 5–7.8, glabrae, basi asymmetricae. Synflorescentia 2–4 cm longa, ca. 1.5 cm lata, capitata, congesta, plerumque interrupta, spatha singularis subtenta. Spiculae aristis inclusis 11.8–19.5 mm longae, 10.5–11.5 mm longae sine aristis; gluma I 12–20 mm longa, 1.1–1.7-plo longior quam lemma, aristata; gluma II 10.2–17.6 mm longa, 1.1–1.5-plo longior quam lemma, aristata; gluma III 11.4–15.7 mm longa, 1.1–1.4-plo longior quam lemma; gluma IV 10.9–13 mm longa, 1–1.1-plo longior quam lemma, obtusata; lemma 9.8–10.7 mm longum; palea 8.6–9.8 mm longa, glabra.

Woody bamboo. Culms 2–3 m long, 0.3–0.5 cm diam., scandent and climbing. Internodes 20–28 cm long, terete, glabrous. Culm leaves 9.4–16.7(–29.3) cm long,  $\pm$  persistent, juncture of sheath and blade abaxially obscure; sheaths 9–26.5 cm long, (9.5–)13–26(–47) times longer the blade, adaxially glabrous and shiny below, pubescent near the summit, abaxially retrorsely scabrous, the midrib manifest near the summit, the overlapping margin ciliate for most of its length, fused to sheath just at the base; girdle 2–5(–10) mm long, to 1 cm long over the bud complement; inner ligule ca. 0.5 mm long, erose; blades 0.3–2.8 cm long, erect, persistent, adaxially pubescent, abaxially the midrib raised and prominent, apex shortly subulate, the margins glabrous. Nodes at mid-culm slightly swollen, with one circular central bud subtended by 5 or 6 smaller subsidiary buds in a constellate arrangement; nodal line horizontal, dipping markedly below the bud/branch complement; supranodal ridge  $\pm$  prominent. Branching infravaginal; leafy subsidiary branches 5–7 per node, to ca. 20 cm long without synflorescences, geniculate, rebranching at the lower nodes. Foliage leaves 3–6 per complement; sheaths striate, glabrous, keeled toward the summit, the margins slightly scarious toward the summit, the overlapping one ciliate for the upper  $\frac{2}{3}$  of its length; outer ligule 0.5–0.6 mm long, bilobed, glabrous; inner ligule 1.5–3.5 mm long, asymmetrical, glabrous; pseudopetiole 3–4 mm long; blades 9–14 cm long, 1.6–2.5 cm wide, L:W = 5–7.8, ovate-lanceolate, glabrous, not tessellate, the base slightly asymmetrical, one side rounded, the other rounded-attenuate, the apex attenuate, the margins thin, finely serrulate. Synflorescence 2–4 cm long, ca. 1.5 cm wide, capitate, congested, often interrupted at the base, subtended by a single spathe, the spathe

with the sheaths 2.3–3.8 cm long, slightly expanded, the blades 1.5–2.2 cm long, green, deciduous; main axis angular, slightly sinuous, pubescent toward the base; axes of the paraclades angular, pubescent, the edges ciliate, the primary paraclades bracteate, the subtending bracts 1.5–3 mm long at the lowermost paraclades, ca. 0.3 mm at the apical paraclades, the lowermost primary paraclades 0.5–1 cm long; peduncles 1–3 mm long. Spikelets 11.8–19.5 mm long including the awns, the body 10.5–11.5 mm long, laterally compressed; glumes I and II triangular, tapering, awned, keeled, abaxially shortly pubescent-scabrous, the awns scabrous; glume I 12–20 mm long including the awn, 1.1–1.7 times the length of the lemma, 3-nerved, the body 3.5–4 mm long, the awn 8.5–16 mm long; glume II 10.2–17.6 mm long, 1.1–1.5 times the length of the lemma, 5-nerved, the body 4–4.5 mm long, the awn 6.2–13.1 mm long; glumes III and IV  $\pm$  navicular, abaxially pubescent-scabrous on the upper  $\frac{1}{3}$ ; glume III 11.4–15.7 mm long including the awn, 1.1–1.4 times the length of the lemma, keeled, 9-nerved, the body 9–11.7 mm long, the awn 2.4–4 mm long; glume IV 10.9–13 mm long, 1–1.1 times the length of the lemma, the apex  $\pm$  blunt, unawned, 7-nerved; lemma 9.8–10.7 mm long,  $\pm$  triangular, navicular, the apex keeled, fused for a short distance, unawned, abaxially the upper  $\frac{1}{2}$  with long appressed hairs, 7-nerved; palea 8.6–9.8 mm long, navicular, biapiculate, glabrous, sulcate only at the apex, 4-nerved. Lodicules 3, ciliate; the anterior pair 2–2.5 mm long, tapering; the posterior one 1.5–2.3 mm long. Stamens 3; anthers ca. 6 mm long. Ovary not seen. Fruit not seen.

*Distribution.* Endemic to the northern extreme of the Central Cordillera of Colombia, only in Mun. Amalfi of the Department of Antioquia; disturbed sites in montane forest; 1650–1900 m.

*Chusquea arachniforme* is named for its geniculate branches that fan out from the node like the legs of a spider (Fig. 7A). This species is distinguished by its climbing habit; culm leaf blades with an abaxially prominent midrib; infravaginal branching; relatively few (5–7), geniculate subsidiary branches per node; rebranching of the subsidiary branches from their lower nodes; relatively wide foliage leaf blades with L:W = 5–7.8; interrupted capitate synflorescences subtended by a single spathe; glumes I and II with well-developed awns; and lemmas with long appressed hairs. The flowering event in 1989 was evidently a gregarious one, as the Sitio Tabanito population we observed in 1994 consisted entirely of juvenile plants of approximately the same age that had not yet achieved



the mature diameter of the culms seen in the flowering specimens.

This species is classified within *Chusquea* subg. *Rettbergia* (Raddi) L. G. Clark with which it shares a climbing habit, abaxially scabrous culm leaves with an abaxially prominent midrib on the blade, infravaginal branching, relatively few branches per node, a circular central bud, and a spatheate synflorescence (Clark, 1997). Sequence data from the *rpl16* intron strongly support the placement of this species, which was designated as *Chusquea* sp. A, in the *Rettbergia* clade within *Chusquea* (Kelchner & Clark, 1997). *Chusquea* subg. *Rettbergia* is primarily distributed in the Atlantic forests of Brazil; *C. barbata* L. G. Clark from Peru (Clark, 1993) and *C. arachniforme* from Colombia are widely disjunct from the rest of this subgenus.

The development of the awns on glumes I and II in *C. arachniforme*, especially on spikelets terminating the main axis or primary paracladia, is remarkable and matched within the genus only by *C. bahiana* L. G. Clark, *C. bradei* L. G. Clark, and *C. urelytra* Hack., also members of *Chusquea* subg. *Rettbergia* but from Brazil (Clark, 1996). The general morphology of the spikelet in *C. arachniforme* is similar to that of *C. bahiana*, but the long hairs on glume IV and the lemma are like those in the spikelets of *C. barbata* and *C. bradei*.

**Paratypes.** COLOMBIA. **Antioquia:** Mun. Amalfi, about 3 km S of Amalfi on the road to Vereda El Guayabito, old road, 6°52'N, 75°05'W, 1760 m, 15 June 1994, Clark, Londoño & Giraldo 1227 (COL, HUA, ISC, TULV, US); Mun. Amalfi, 5.7 km S of Amalfi on the road to El Guayabito, sitio El Tabanito, 6°52'N, 75°05'W, 1900 m, 15 June 1994, Clark, Londoño & Giraldo 1228 (COL, HUA, ISC, TULV, US).

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#### Literature Cited

- Clark, L. G. 1989. Systematics of *Chusquea* Section *Swal-lenochloa*, Section *Verticillatae*, Section *Serpentes*, and Section *Longifoliae* (Poaceae–Bambusoideae). Syst. Bot. Monogr. 27: 1–127.
- . 1993. Five new species of *Chusquea* (Poaceae: Bambusoideae) and a new combination. Novon 3: 228–238.
- . 1995. Diversity and distribution of the Andean woody bamboos (Poaceae: Bambuseae). Pp. 501–512 in S. P. Churchill et al. (editors), Biodiversity and Conservation of Neotropical Montane Forests. The New York Botanical Garden, Bronx.
- . 1996. Four new species of *Chusquea* (Poaceae: Bambusoideae) from Brazil and Ecuador. Brittonia 48: 250–262.
- . 1997. Diversity, biogeography, and evolution of *Chusquea* (Poaceae: Bambusoideae). Pp. 33–44 in G. P. Chapman (editor), The Bamboos. Academic Press, London.
- & X. Londoño. 1991. A new species and new sections of *Rhipidocladum* (Poaceae: Bambusoideae). Amer. J. Bot. 78: 1260–1279.
- Estrada, J. & J. Fuertes. 1993. Estudios botánicos en la Guayana colombiana, IV. Notas sobre la vegetación y la flora de la Sierra de Chiribiquete. Rev. Acad. Col. Ciencias 18: 483–498.
- Judziewicz, E. J. & L. G. Clark. 1993. A revision of the South American species of *Arthrostylidium* (Poaceae: Bambusoideae). Syst. Bot. 18: 80–99.
- , G. Davidse & L. G. Clark. 1991. Six new bamboos from the Venezuelan Guayana. Novon 1: 76–87.
- , L. G. Clark, X. Londoño & M. J. Stern. In press. The American Bamboos. Smithsonian Institution Press, Washington, D.C.
- Kelchner, S. A. & L. G. Clark. 1997. Molecular evolution and phylogenetic utility of the chloroplast *rpl16* intron in *Chusquea* and the Bambusoideae (Poaceae). Molec. Phylog. Evol. 8: 385–397.
- Londoño, X. 1990. Aspectos sobre la distribución y la ecología de los bambues de Colombia (Poaceae: Bambusoideae). Caldasia 16: 139–153.
- Pohl, R. W. 1985. Three new species of *Rhipidocladum* from Mesoamerica. Ann. Missouri Bot. Gard. 72: 272–276.
- Sanchez Paez, H., J. I. Hernandez C., J. V. Rodriguez M. & C. Castaño U. 1990. Nuevos Parques Nacionales de Colombia. Instituto Nacional de Los Recursos Naturales Renovables y del Ambiente–INDERENA, Bogotá.
- Sendulsky, T. 1997. Twelve new species of *Merostachys* (Poaceae: Bambusoideae: Bambuseae) from Brazil. Novon 7: 285–307.
- Stapleton, C. M. A. 1997. The morphology of the woody bamboos. Pp. 251–267 in G. P. Chapman (editor), The Bamboos. Academic Press, London.